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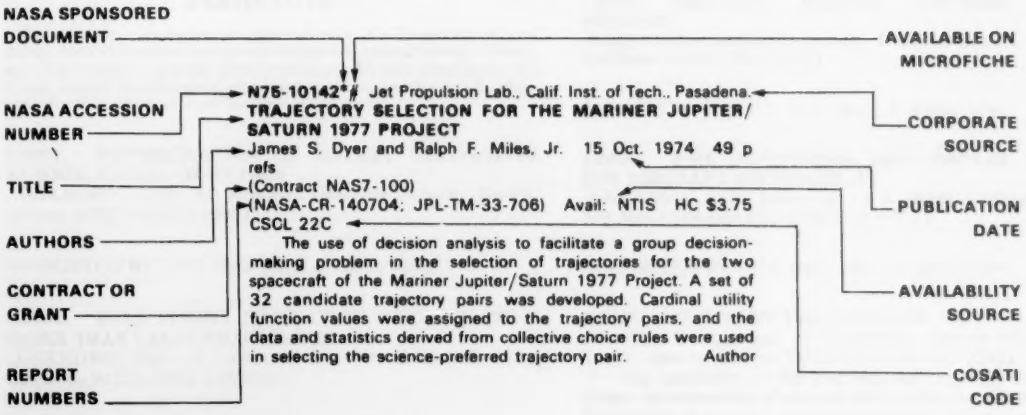
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N75-10142*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
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TRAJECTORY SELECTION FOR THE MARINER JUPITER/ SATURN 1977 PROJECT
TITLE
James S. Dyer and Ralph F. Miles, Jr. 15 Oct. 1974 49 p refs
PUBLICATION DATE
AUTHORS
(Contract NAS7-100)
(NASA-CR-140704; JPL-TM-33-706) Avail: NTIS HC $3.75
AVAILABILITY SOURCE
CONTRACT OR GRANT
CSCL 22C
The use of decision analysis to facilitate a group decision-making problem in the selection of trajectories for the two spacecraft of the Mariner Jupiter/Saturn 1977 Project. A set of 32 candidate trajectory pairs was developed. Cardinal utility function values were assigned to the trajectory pairs, and the data and statistics derived from collective choice rules were used in selecting the science-preferred trajectory pair. Author
REPORT NUMBERS
COSATI CODE

ON-GOING RESEARCH PROJECTS

This is a listing of research projects - not publications

AERONAUTICS

Includes Aeronautics (general); Aerodynamics; Air Transportation and Safety; Aircraft Communications and Navigation; Aircraft Design, Testing, and Performance; Aircraft Instrumentation; Aircraft Propulsion and Power: Aircraft Stability and Control; and Research And Support Facilities (air). For Related Information See Also Astronautics.

1.0001, DETERMINATION OF ROTARY DERIVATIVES AT HIGH ANGLES OF ATTACK
UNKNOWN, Univ. of Arizona, Graduate School, *Tucson, Arizona* 85721 (NCA 2-40501)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

1.0002, FULL FLIGHT SIMULATION INCORPORATING TASKS THAT CAUSE PILOT ERROR
UNKNOWN, Univ. of California, Graduate School, *Berkeley, California* 94720 (NCA 2-50503)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

1.0003, VISUALIZATION AND QUANTITATIVE ANALYSIS OF VORTEX-WAKE OF AIRCRAFT BY MOVIE HOLOGRAPHY
A.F. CHARWAT, Univ. of California, School of Engineering, *Los Angeles, California* 90024 (NSG 2068)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

1.0004, UNSTEADY AERODYNAMIC FLOWS AND AEROELASTIC EFFECTS
H. ASHLEY, Stanford University, School of Engineering, *Palo Alto, California* 94305 (AF-AFOSR-2712-74)

The AF will require improved aerospace vehicles in the foreseeable future capable of efficient, high performance flight. In order to design such vehicles, advances in the technology area of vehicle dynamics will be necessary. The methods of predicting and controlling or preventing the occurrence of critical dynamic and aeroelastic phenomena which either endanger flight safety or degrade performance need to be improved. This research is developing improved analytical procedures for predicting unsteady and steady aerodynamic forces acting on wings and bodies for both high and low speed flight, and studying important dynamic and aeroelastic phenomena encountered during the operation of flight vehicles. Topics for investigation will be the following -- (a) unsteady aerodynamic problems related to rotors and propellers, (b) unsteady hypersonic flow past three-dimensional shapes, (c) prediction of chordwise loads on wings (d) aeroelastic applications on structural optimization and the influence of fore-and-aft motion on flutter of rotors and wings of large span and (e) active control of aeroelastic instabilities combined with the optimization studies.

Supporting agency address information: AF Office of Scientific Research NA, 1400 Wilson Blvd, Arlington, VA 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0005, AIRCRAFT DIGITAL CONTROL DESIGN METHODS
UNKNOWN, Stanford University, Graduate School, *Palo Alto, California* 94305 (NSG 1137)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

1.0006, FIRE SUPPRESSION AND CONTROL SYSTEMS FOR AIRCRAFT SURVIVABILITY
UNKNOWN, Calif. State Univ. & Colleges, Graduate School, *San Jose, California* 95114 (NCA 2-75505)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

1.0007, UNSTEADY VISCOUS FLOW
J.C. WU, Georgia Inst. of Technology, School of Aerospace Engin., *Atlanta, Georgia* 30332 (N00014-75-C-0249)

The prediction of the gust response, dynamic stability and flutter characteristics of aircraft and missiles requires an accurate knowledge of unsteady aerodynamic flows. Because of the complex nature of such flows when viscous effects are important, coupled with the limited availability of reliable measurements, serious shortcomings exist in existing predictive methods. The objective of this research is to use numerical solutions of the Navier-Stokes equations to assess the assumptions, approximations, and ranges of validity of existing inviscid theories for oscillating airfoils.

In this research an integro-differential formulation of the incompressible Navier-Stokes equations will be used to compute the complete history of the viscous flow field development about an airfoil undergoing sinusoidal oscillations in sufficient detail to permit the delineation of the various flow features, including the periodic shedding of vortices and the accompanying change of circulation, and the periodic variations of pressure, forces and moments. Calculations will be made for a range of frequencies appropriate to aircraft and missile flight. Corresponding inviscid calculations will be used for assessment purposes.

Supporting agency address information: Office of Naval Research, Arlington, VA 22217

SUPPORTED BY U.S. Dept. of Defense - Navy

1.0008, CONDENSATION IN A SUPERSONIC NOZZLE
P.M. SHERMAN, Univ. of Michigan, School of Engineering, *Ann Arbor, Michigan* 48106

An experimental study of homogeneous condensation and droplet growth will be performed. The condensing vapor will be injected into air in the stagnation chamber of a supersonic wind tunnel. The mixture will be expanded through a long supersonic nozzle, and measurements of particle size will be obtained at various axial locations. In addition to measurements of particle growth, the axial pressure variation and the rate of change of the number of particles will be determined. Optical techniques will be employed for sensing nucleation and growth of the particles. Water vapor will be investigated initially; in later stages of the research other vapors will be chosen in accordance with variations in properties (surface tension, saturation parameters, etc.) and will also be studied. Comparisons of experimental findings with available analyses will be made in order to reveal the most

significant effects to be considered in realistic modeling of this phenomena. The results of this research have potential application to condensation problems in turbines, internal combustion engines, propulsion devices, wind tunnels, hypersonic wakes, and atmospheric and air pollution phenomena.

SUPPORTED BY U.S. Natl. Science Foundation

1.0009, STATE-OF-THE-ART REVIEW
E. LISTER, U.S. Navy, Air Propulsion Test Center, *Trenton, New Jersey* 08641

To continually develop for, and make available to the Navy, the latest state-of-the-art information regarding airbreathing propulsion and associated areas.

Continually update a data bank of engine and engine component characteristics and performance. Periodically prepare state-of-the-art reports (SOAR) on major engine components and subsystems (United States and foreign). This type of information is a basic ingredient for the development of advanced planning requirements and program selection.

Supporting agency address information: Naval Air Systems Command, Propulsion Technology Administrator, Washington, D. C. 20361

SUPPORTED BY U.S. Dept. of Defense - Navy

1.0010, PROGRAM COORDINATION AND ANALYSES
E. LISTER, U.S. Navy, Air Propulsion Test Center, *Trenton, New Jersey* 08641

To formulate and technically direct airbreathing propulsion and propulsion oriented exploratory development programs for NavAir. Coordinate Navy Cat. 6.2 with other government and NASA efforts. Provide transition of Cat. 6.2 efforts into Cat. 6.3.

Coordinate with Air-330 and Air-536 to establish short and long range Exploratory Development (EDP) and Advanced Development Program plans. Prepare an EDP planning. Solicit ideas, plans, and proposals from government and industry. Evaluate these inputs in light of the overall EDP plan. Formulate plans and recommend sufficient funding to support the required efforts. Coordinate with other government organizations to optimize the effectiveness of all programs. Review IRAD (brochure and on-site) proposals. Participate in tri-service technical meetings.

Supporting agency address information: Naval Air Systems Command, Propulsion Technology Administrator, Washington, D. C. 20361

SUPPORTED BY U.S. Dept. of Defense - Navy

1.0011, PERFORMANCE TESTS OF HYDRAULIC POWER TRANSFER UNITS
S.P. CONDON, U.S. Air Force, Aero Propulsion Lab., *Dayton, Ohio* 45433

To conduct performance tests on rotary and oscillating piston type power transfer units to provide comparison data for future hydraulic system applications. Specific areas to be emphasized are breakout pressures, stability, noise, pulsations, and efficiency.

A rotary type power transfer unit presently used on the C-5 aircraft has been purchased and will be tested in a special test setup to be fabricated in Room 16, Building 18. A prototype oscillating piston power transfer unit which is a delivery item under contract F33615-72-C- 1078 will then be tested under identical conditions using the same test setup.

Supporting agency address information: AF Aero-Propulsion Laboratory POP, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0012, DESIGN TECHNIQUES TO PREDICT AND MINIMIZE INTERFERENCE HEATING
J.R. HAYES, U.S. Air Force, Flight Dynamics Lab., *Dayton, Ohio* 45433

Interference heat transfer is the main thermal problem of supersonic missiles and aircraft. Aerodynamic control surface and their actuators are especially critical as it is these which generally cause and are subjected to the increased heating rates. The objective of this study is to integrate the results of previous and current in-house and contract work elements into a coherent design technique. Data trends will be generalized through the development of an analytical flow model. The design report will provide confidence in the selection of control surfaces and materials, thus eliminating costly ground verification tests and insuring maximum vehicle performance.

A design report and computer technique will be prepared which will analytically extend and generalize results from previous work elements. Minor experimentation will be completed in order to fully understand data trends. The design report will conclude a significant portion of exploratory development work and suggest problem areas which still exist for future research activity.

Supporting agency address information: AF Flight Dynamics Laboratory FXG, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0013, X-24B FLIGHT RESEARCH AND PROJECT MANAGEMENT
W.P. ZIMA, U.S. Air Force, Flight Dynamics Lab., *Dayton, Ohio* 45433

Current Air Force weapons system development activity does not provide for flight research with advanced aerospace vehicles which are designed uniquely for very high speed maneuvering and/or performance. This results in a lack of technical and piloting experience in futuristic vehicle configurations which are capable of transitioning the flight regimes from hypersonic to landing. The X-24B research vehicle is designed to partially fill this void by providing experience with an advanced configuration in the low supersonic to landing flight regimes. The specific objectives of this effort is to provide for a continuum of effort on the X-24B program by directing the flight research and project management support to the data gathering and reporting phases of the flight program. Preceding phases, including vehicle modification and flight envelope expansion, have been covered under work unit 14310204.

The data gathering and reporting phases of the X-24B program shall consist of approximately fifteen flights of the X-24B research vehicle during which data instrumental to the development of design criteria shall be gathered. Following the acquiring of the data it shall be reduced, correlated with theoretical and empirical predictions and reported on.

Supporting agency address information: AF Flight Dynamics Laboratory FXS, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

1.0014, AIR TRAFFIC CONTROL SECTOR DESIGN
W.J. DUNLAY, Univ. of Texas, School of Engineering, *Austin, Texas* 78712

Description: Object of research is to develop a procedure for optimally partitioning a large network of airways into smaller units called sectors for assignment to individual air traffic controllers. Application of various optimization techniques will be attempted to accomplish this objective. The FAA is cooperating by providing data and design criteria.

SUPPORTED BY University of Texas

1.0015, HIGH SPEED AERODYNAMICS
J.A. SCHETZ, Virginia Polytechnic Institute, School of Engineering, *Blacksburg, Virginia* 24061

Topics of high speed aerodynamics will be investigated. Boundary layer and turbulence in supersonic flow: compressible turbulent shear flow fluctuations; generation of strong fluctuation fields; velocity, pressure, temperature, and density measurements; viscous-inviscid interactions; slot injection. Supersonic flows around axisymmetric bodies: steady and unsteady flows, suction and blowing, through body surface of solid and porous cones; wing-body systems with viscous- inviscid interaction effects; disturbance phenomena in non-uniform high speed flows. Aerothermodynamics of combustion: two-phase mixing, instability and interaction at interface between liquid film and high speed gas flow, heat and mass transfer, combustion; correlation between smoke-generating and physico-chemical characteristics of fuel;

shock- combustion wave interactions in supersonic flows past plane and conical solid or fluid surfaces.

The work will be accomplished in cooperation with Dr. Elie Carafoli, Institute for Fluid Mechanics and Aerospace Construction, Bucharest, and Polytechnic Institute of Bucharest.

SUPPORTED BY U.S. Natl. Science Foundation

1.0016, HT 74-15- EFFECTS OF FUSELAGE SHAPING FOR LOW RADAR CROSS SECTION %RCSN FUSELAGE DRAG
D.M. SITTON, U.S. Army, Air Mobility Res. & Dev. Lab., *Newport News, Virginia* 23604

To explore the effects of fuselage shaping to achieve low RCS on the fuselage drag. This effort will be phased to allow review of the Phase I analysis effort for results before a Phase II effort to perform model testing is conducted.

Task I of Phase I will establish a low drag fuselage around the volume requirements of a UTTAS type helicopter. Task II will develop from the baseline a series of fuselage shapes for low RCS based on available methods. Task III will evaluate each shape for resultant drag using flow field analysis and parasite drag prediction. Task IV will incorporate the results into a final report if Phase II is not to be conducted. Phase II, if conducted, will construct models of selected configurations for aerodynamic testing, and measuring of RCS and data from these tests would be combined with Phase I for a final report.

Supporting agency address information: AVCOM Eustis Directorate, US Army Air Mobility R&D Lab., Ft. Eustis, VA 23604

SUPPORTED BY U.S. Dept. of Defense - Army

1.0017, SENSOR FOR MEASURING INSTANTANEOUS ANGLE OF ATTACK OF HELICOPTER BLADES
P.S. BARNA, Old Dominion University, School of Engineering, *Norfolk, Virginia* 23508 (NSG 1143)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

ASTRONAUTICS

Includes Astronautics (general); Astrodynamics; Ground Support Systems and Facilities (space); Launch Vehicles and Space Vehicles; Space Transportation; Spacecraft Communications; Command and Tracking; Spacecraft Design, Testing, and Performance; Spacecraft Instrumentation; and Spacecraft Propulsion and Power. For Related Information See Also Aeronautics.

2.0001, DATA ANALYSIS FOR DUAL AIR DENSITY SATELLITES
K. MAUERSBERGER, Univ. of Minnesota, Graduate School, *Minneapolis, Minnesota* 55455 (NAS 1-13712)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

2.0002, RELATIVE SATELLITE MOTION DETERMINATION AND PREDICTION
B.D. TAPLEY, Univ. of Texas, School of Engineering, *Austin, Texas* 78712 (NAS 5-20946)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

2.0003, SUPPORTING TESTS FOR DYNAMIC MODEL TESTS OF SPACE SHUTTLE
W.L. HUFFERD, Univ. of Utah, Graduate School, *Salt Lake City, Utah* 84112 (NSG 1113)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

CHEMISTRY AND MATERIALS

Includes Chemistry and Materials (general); Composite Materials; Inorganic and Physical Chemistry; Metallic Materials; Nonmetallic Materials; and Propellants and Fuels.

3.0001, THERMAL PROPERTIES OF CHOLESTERIC LIQUID CRYSTALS
B.C. PARK, U.S. Army, Res. Development Engineer Lab., *Huntsville, Alabama* 35809

To investigate the principles governing the thermal responses of cholesteric liquid crystals and to apply this technology to missiles and missile related hardware. This technology should find immediate application in determining the temperature of solid missile propellants, determining the damage to structural support composite panels of helicopters caused by the shock wave of firing missiles, and in determining the structural integrity of helicopter blades and other missile related hardware. The main thrust is determining temperatures of solid propellants.

The principles governing the thermal properties of liquid crystals will be investigated and an attempt will be made to design liquid crystals that change colors in the areas of minus 60 degrees F to plus 160 degrees F in 10 degree increments. These crystals will be used to determine the temperatures of solid propellants. If the solid propellant temperature is known before firing, the guidance control systems can compensate for thermal variability, resulting in improved accuracy. This technology will also be applied to areas of composite structures on missile-carrying helicopters. Helicopter blades, doors, and support panels fall into this category.

Supporting agency address information: Micom GE & M Directorate, US Army Missile RD E Laboratory, Redstone AR, AL 35809

SUPPORTED BY U.S. Dept. of Defense - Army

3.0002, STRUCTURE - FUNCTION RELATIONSHIPS IN THERMOPHILE MEMBRANES
UNKNOWN, Calif. State Univ. & Colleges, Graduate School, *Fullerton, California* 92631 (NCA 2-53501)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0003, INVESTIGATION OF BRITTLE FRACTURE IN GRAPHITE EPOXY COMPOSITES, ARMY AIRCRAFT STRUCTURES
L.B. GRESZCZUK, McDonnell Douglas Astron. Co., *Huntington Beach, California* 92647 (DAAJ02-74-C-0009)

To identify and characterize the impact brittle fracture mechanism experienced by graphite-epoxy composites when subjected to foreign object impact tests. Determine material variables (i.e., fiber properties, fiber orientation, laminae stacking sequence, matrix material, thickness, curvature, interleaving a second material) which affect the brittle fracture mechanism of composite structures and the resultant effect on structural qualitiies. Develop a computer program for evaluation of impact behavior of composite designs. Improved impact resistance of graphite-epoxy composites is needed to allow their use in Army aircraft structures.

Modify an existing computer program to allow evaluation of composites with laminae at varying angles and to account for curvature. Use computer analysis to develop less brittle composites and verify analysis with a test program.

Supporting agency address information: AMC Eustis Directorate, Air Mobility Research and Development Laboratory, Ft. Eustis, VA 23604

SUPPORTED BY U.S. Dept. of Defense - Army

3.0004, QUANTUM CHEMICAL CALCULATIONS FOR PREDICTION OF MASS SPECTRA
UNKNOWN, Stanford University, Graduate School, *Palo Alto, California* 94305 (NCA 2-45506)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0005, BASIC CHEMICAL AND PHYSICAL PROPERTY EVALUATION, HAZARD ANALYSIS, AND HANDLING OF SYNTHETIC JP-5 FUEL

H.W. CARHART, U.S. Navy, Research Laboratory, *Washington, District of Columbia* 20390

To determine the basic chemical, physical, and flammability properties of JP-5 fuels derived from coal and oil shale, and to determine the shipboard handling, safety, and storage charactertistics of such fuels. To determine the effectiveness of standard fire fighting techniques with synthetic fuel and to develop additional methods and procedures as needed to make shipboard fuel management meet current operational and safety standards. This effort is in support of an engine/aircraft flight test program utilizing the S-3a aircraft with the Tf34Ge-2 engines.

NRL will perform a comprehensive chemical, physical, and flammability program to evaluate the characteristics of JP-5 fuels derived from shale oil and coal. The NRL work will emphasize non- specification tests and chemical analyses. Fire suppression techniques for substitute JP-5 will be evaluated in tests up to volumes of 300 gallons of fuel.

Supporting agency address information: Naval Air Systems Command (330B/330C), Washington, D.C. 20361

SUPPORTED BY U.S. Dept. of Defense - Navy

3.0006, DETERMINATION OF ENERGY RELEASE RATES

B.C. TAYLOR, U.S. Army, Ballistic Research Lab., *Aberdeen Proving Ground, Maryland* 21005

To determine the net energy release rate in thin samples of shocked explosives and propellants as a function of explosive physical parameters (such as grain size) and pressure.

Light gas gun experiments will be analyzed using a hydrocode. In the experiments the free surface velocity on the downstream side of a sample is measured after the sample has been impacted by a flyer plate of known velocity and thickness. In the analysis, the energy release rate in a hydrocode will be varied in order to reproduce the data.

Supporting agency address information: AMC Ballistic Research Laboratories, Aberdeen PG, MD 21005

SUPPORTED BY U.S. Dept. of Defense - Army

3.0007, INVERSE LASER RAMAN SPECTROSCOPY

W.G. VONHOLLE, U.S. Army, Ballistic Research Lab., *Aberdeen Proving Ground, Maryland* 21005

The objective is to identify reaction species associated with the pressure spike which occurs in the ignition of liquid propellants.

The spectra of the reaction products of low pressure shock waves in certain liquid propellants will be measured using inverse Raman absorption.

Supporting agency address information: AMC Ballistic Research Laboratories, Aberdeen PG, MD 21005

SUPPORTED BY U.S. Dept. of Defense - Army

3.0008, ION BEAM SPUTTER ETCH AND DEPOSITION STUDY

G.K. WEHNER, Univ. of Minnesota, School of Engineering, *Minneapolis, Minnesota* 55414 (NSG 3041)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

3.0009, INTEGRATED AIRCRAFT FUEL TANK FIRE AND EXPLOSION PROTECTION TECHNIQUES

Q. MALMBURG, McDonnell Douglas Corporation, *St. Louis, Missouri* 63166 (F33615-74-C-2008)

The objectives of this program are (1) to assess all pertinent aspects of current and experimental fuel tank fire and explosion protection techniques and (2) to test and evaluate various void filler materials and/or other promising or potential techniques for fuel fire protection of areas adjacent to aircraft fuel tanks.

This program consists of four tasks- (1) the contractor shall compile and evaluate all available information concerning state-of-the-art fire and explosion techniques for aircraft fuel tanks, (2) the contractor shall compile and evaluate all available information concerning advanced fire and explosion techniques for aircraft fuel tanks (advanced being those techniques which still require developmental work, which have not been properly evaluated or have not been installed on operational aircraft), (3) the contractor shall perform a series of tests to determine the effectiveness of certain void area fire protection techniques, and (4) the contractor shall compare Task 1 assessments with Task 2 assessments and incorporate the results from Task 3 in the comparison. A final report will be prepared describing the work performed.

Supporting agency address information: AF Aero-Propulsion Laboratory SFH, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

3.0010, LUBRICITY PROPERTIES OF HIGH TEMPERATURE JET FUEL

R.S. SHERTZER, U.S. Navy, Air Propulsion Test Center, *Trenton, New Jersey* 08641

To determine the effects of fuel variables or components on friction, wear, and seizure of pumps and to define ways of improving fuel lubricity. The fuel variables include viscosity, hydrocarbon type, trace elements such as nitrogen, sulfur, and oxygen bearing compounds, and additives.

Determine the effect of fuel variables on various fluids, such as a pure hydrocarbon (dodecane) and jet fuel blends (synthetic jet fuels). Baseline data would be obtained on these fluids by determining their lubricity characteristics in a lubricity tester. The effect of many naturally occurring fuel components could then be evaluated at varying concentrations to determine their effects individually and/or in combination. The accumulation of these data would then be utilized to develop a JP-5 lubricity additive to improve the lubricity characteristics of hydrotreated fuels when required.

Supporting agency address information: Naval Air Systems Command, Propulsion Technology Administrator, Washington, D. C. 20361

SUPPORTED BY U.S. Dept. of Defense - Navy

3.0011, QUALITY OF CRUDE OILS AND PRODUCTS

H.J. COLEMAN, U.S. Dept. of the Interior, Bureau of Mines, *Bartlesville, Oklahoma* 74003

Periodic Bureau of Mines Petroleum Product Survey reports will be published in cooperation with the American Petroleum Institute during FY 1975 on the quality and characteristics of both winter and summer motor gasolines, aviation turbine fuels, diesel fuels, and burner fuel oils being refined and marketed in the U.S. during 1974.

Crude oil samples from important new high-production fields around the world will be analyzed to provide information on the quality of the nation's petroleum reserves and the quality of imported oils.

SUPPORTED BY U.S. Dept. of Interior - Bureau of Mines

ENGINEERING

Includes Engineering (general); Communications; Electronics and Electrical Engineering; Fluid Mechanics and Heat Transfer; Instrumentation and Photography; Lasers and Masers; Mechanical Engineering; Quality Assurance and Reliability; and Structural Mechanics. For Related Information See Also Physics.

4.0001, STUDY OF SOLID PROPELLANT ROCKET MOTOR INTERNAL BALLISTIC PERFORMANCE VARIATION

UNKNOWN, Auburn University, Graduate School, *Auburn, Alabama* 36830 (NCA 8-106)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0002, STUDY OF EFFICIENT LOW POWER DIFFRACTOMETER DESIGNS
J.C. GREGORY, Univ. of Alabama, Graduate School, *Huntsville, Alabama* 35807 (NAS 8-31170)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0003, ROCKET ENGINE THRUST CHAMBER WALL TEMPERATURE DISTRIBUTION CALCULATION AND ANALYSIS
H. SAHA, Alabama Agric. & Mech. Univ., Graduate School, *Normal, Alabama* 35762 (NSG 8022)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0004, MAINTENANCE AND OPERATION OF THE 60' NASA TELESCOPE AT MT LEMMON
C.P. SONETT, Univ. of Arizona, Graduate School, *Tucson, Arizona* 85721 (NAS 8-31192)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0005, REPLACEMENT OF OPTICS FOR THE NASA 1.5 METER TELESCOPE
C.P. SONETT, Univ. of Arizona, Graduate School, *Tucson, Arizona* 85721 (NAS 8-31196)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0006, DESIGN AND LABORATORY TESTING OF ELECTROMAGNET SYSTEMS
UNKNOWN, Univ. of California, Graduate School, *Berkeley, California* 94720 (NCA 2-50406)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0007, AUTOMATED STRUCTURAL DESIGN
UNKNOWN, Univ. of California, Graduate School, *Los Angeles, California* 90024 (NCA 2-90405)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0008, DYNAMIC CRITICAL DAMPING OF CAPACITOR DISCHARGE CIRCUIT
UNKNOWN, Stanford University, Graduate School, *Palo Alto, California* 94305 (NCA 2-45425)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0009, HEAT TRANSFER IN AN ANNULAR GAP WITH COMBINED AXIAL AND CIRCUMFERENTIAL FLOW
R.H. SABERSKY, Calif. Inst. of Technology, School of Engineering, *Pasadena, California* 91109

Convective heat transfer in the annular gap between concentric cylinders will be investigated for the case in which the inner surface rotates relative to a stationary outer cylinder. Measurements of temperatures and heat transfer will be obtained for various rotational speeds, axial flow rates, and surface roughness conditions. Prandtl number variations will be obtained by using different fluids including water, an alcohol, and silicon oils. Flow visualization studies will also be conducted to reveal flow patterns and instability phenomena that are associated with observed changes of cooling effectiveness. The experimental results will be interpreted with respect to analytical models where possible. Results of this research have potential application to the cooling of compact high performance electric motors and other rotating machinery.

SUPPORTED BY U.S. Natl. Science Foundation

4.0010, NEW FORMULATION OF TENSOR ANALYSIS AND ITS APPLICATION TO NUMERICAL SOLUTION OF FLUID MECHANICS
UNKNOWN, Univ. of Santa Clara, Graduate School, *Santa Clara, California* 95053 (NCA 2-85409)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0011, COMPUTER AUTOMATION FOR FEEDBACK SYSTEM DESIGN
I.M. HOROWITZ, Univ. of Colorado, School of Engineering, *Boulder, Colorado* 80302 (NSG 1140)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0012, COMPUTER CONTROL OF AIRO TELESCOPES
W. WEBB, Univ. of Colorado, Graduate School, *Boulder, Colorado* 80302 (NSG 2055)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0013, DEVELOPMENT OF A THREE DIMENSIONAL COMBUSTOR FLOW ANALYSIS
H.M. MCDONALD, United Aircraft Corporation, *Hartford, Connecticut* 06118 (F33615-74-C-2028)

The objective of the program is to modify and extend an existing three-dimensional Navier-Stokes calculation procedure previously developed at UARL so that it would be capable of computing combustor flows. In particular, the procedure would be extended so as to include the effects of chemistry, turbulence, radiation and two phase flow and, in addition, the procedure would be modified to enable treatment of a realistic range of combustor geometries.

This procurement is a 29-month research and exploratory development program to develop a three-dimensional Navier-Stokes calculation procedure to enable the treatment of combustor flows. The procedure will include the effect of chemical reactions, turbulence transport, radiation energy flux and droplet vaporization and burning. It will be applicable to both can-annular and annular combustor geometries.

Supporting agency address information: AF Aero-Propulsion Laboratory TBC, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0014, NAVY/NASA WING IN GROUND EFFECT INVESTIGATION
D.W. LACEY, U.S. Navy, Aviation & Surface Eff. Dept., *Washington, District of Columbia* 20034

To determine the performance potential and stability and control of a low-aspect-ratio wing-in-ground-effect configuration over water in a high speed towing basin.

Use wind tunnel models from NASA over water to conduct static force and moment tests. The NSRDC tow tank at Langley will be used for the over water tests.

Supporting agency address information: Naval Ship R&D Center 01, Bethesda, MD. 20034

SUPPORTED BY U.S. Dept. of Defense - Navy

4.0015, INVESTIGATION OF ELECTRICAL PROPERTIES OF CONDUCTIVE ADHESIVES AND FILM RESISTORS
J. SERGENT, Univ. of South Florida, School of Engineering, *Tampa, Florida* 33620 (NAS 8-31172)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0016, PREDICTION OF CRYOGENIC HEAT PIPE PERFORMANCE
G.T. COLWELL, Georgia Inst. of Technology, School of Engineering, *Atlanta, Georgia* 30332 (NSG 2054)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0017, INFLUENCE OF HIGH TRACTION FLUIDS ON ELASTOHYDRODYNAMIC TRACTION
H.S. CHENG, Northwestern University, School of Technology, *Evanston, Illinois* 60201 (NSG 3042)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0018, EFFECTS OF ATMOSPHERIC REFRACTION AND TURBULENCE ON THE ACCURACY OF LASER SYSTEMS
C.S. GARDNER, Univ. of Illinois, School of Engineering, *Urbana, Illinois* 61801 (NSG 5049)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0019, AERODYNAMICALLY INDUCED VIBRATIONS IN TURBOMACHINES
G.D. HUFFMAN, Indianapolis Ctr. For Adv. Res, *Indianapolis, Indiana* 46202 (F44620-74-C-0065)

An experimental investigation will be carried out at Detroit Diesel Allison in a rotating cascade. In particular, a large diameter, low speed, single-stage axial compressor will be used to evaluate stator vane aerodynamically induced vibrations. The rotor will serve as the source of an unsteady inlet flow field which will be mapped using hot wire anemometry. These wake measurements will be correlated with the rotor blade location yielding a complete picture of the stator inlet flow field. Two stator vane configurations will be investigated with time-dependent pressure measurements made on both the pressure and suction surfaces. The time-dependent data will be obtained over a series of reduced frequencies. This variation will be accomplished by changing the number of rotor blades while keeping the mass flow and relevant velocity vectors the same.

Supporting agency address information: AF Office of Scientific Research NA, 1400 Wilson Blvd, Arlington, VA 22209

SUPPORTED BY U.S. Dept. of Defense - Air Force

4.0020, VISCOUS CORNER FLOW STUDIES
UNKNOWN, Iowa State University, Graduate School, *Ames, Iowa* 50010 (NCA 2-40505)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0021, AN ANALYSIS OF INFINITE ARRAYS FOR LARGE MICROSTRIP ANTENNA DESIGN
A.W. BIGGS, Univ. of Kansas, School of Engineering, *Lawrence, Kansas* 66044 (NSG 1142)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0022, INVESTIGATION OF DRAG REDUCTION ON BOX SHAPED GROUND VEHICLES
V.U. MUIRHEAD, Univ. of Kansas, School of Engineering, *Lawrence, Kansas* 66044 (NSG 4004)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0023, CONDITION EFFECTS ON A TURBULENT SHEAR LAYER
J.F. FOSS, Michigan State University, School of Engineering, *East Lansing, Michigan* 48824 (NSG 1138)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0024, COMMUNICATION LINKS
T.L. NOACK, Univ. of Missouri, School of Engineering, *Columbia, Missouri* 65201 (NAS 5-20826)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0025, RESEARCH INTO THE PERFORMANCE LIMITS IN AXIAL GROOVE HEAT PIPES
K.T. FELDMAN, Univ. of New Mexico, School of Engineering, *Albuquerque, New Mexico* 87106 (NSG 2064)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0026, PROPAGATION AND ATTENUATION OF COMPLEX ACOUSTIC WAVES IN TREATED CIRCULAR AND ANNULAR DUCTS
G. REETHOF, Penn. State University, School of Engineering, *University Park, Pennsylvania* 16802 (NSG 1126)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0027, ACTIVE CONTROL OPTIMIZATION TECHNIQUES
C.S. RUDISILL, Clemson University, School of Engineering, *Clemson, South Carolina* 29631 (NSG 1125)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0028, ADSORPTION PUMPING CRYOGENIC REFRIGERATION STUDY
W.H. HARTWIG, Univ. of Texas, School of Engineering, *Austin, Texas* 78712 (NAS 9-14491)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0029, DEFINITION AND FABRICATION OF AN AIRBORNE SCATTEROMETER RADAR SIGNAL PROCESSOR
J.A. SCHELL, Texas A & M University System, Graduate School, *College Station, Texas* 77843 (NAS 9-14493)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0030, THEORETICAL STUDY OF THE INTERACTION BETWEEN A TURBULENT BOUNDARY LAYER AND A COMPLIANT SURFACE
R.L. ASH, Old Dominion University, School of Engineering, *Norfolk, Virginia* 23508 (NSG 1100)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0031, RADIATION INVESTIGATIONS OF OPTICAL AND ELECTRONIC COMPONENTS USED IN ASTRONOMICAL SATELLITE STUDIES
J. BECHER, Old Dominion University, School of Science, *Norfolk, Virginia* 23508 (NSG 5053)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0032, INVESTIGATION OF NOZZLE AFTERBODY VISCOUS INTERACTION EFFECTS BY FINITE ELEMENT METHODS
C.H. COOKE, Old Dominion University, School of Engineering, *Norfolk, Virginia* 23508 (NSG 1098)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

4.0033, ANALYTICAL SIMULATION OF JET NOISE AND THE UNSTEADY JET FLOW-FIELD BY A MODEL OF PERIODIC SHEDDING OF VORTEX RINGS (ABBREV)
G.L. GOGLIA, Old Dominion University, School of Engineering, *Norfolk, Virginia* 23508 (NSG 1144)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

GEOSCIENCES

Includes Geosciences (general); Earth Resources; Energy Production And Conversion; Environment Pollution; Geophysics; Meteorology and Climatology; and Oceanography. For Related Information See Also Space Sciences.

5.0001, OPTICAL DATA PROCESSING STUDY
L.J. PINSON, Auburn University, Graduate School, *Auburn, Alabama* 36830 (NAS 8-31223)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0002, STUDY OF INTERNAL WAVE MOTIONS ON THE NEUTRAL ATMOSPHERE
R.J. HUNG, Univ. of Alabama, School of Science, *Huntsville, Alabama* 35814 (NAS 8-31171)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0003, CLOUD PHYSICS LABORATORY PROJECT SCIENCE AND APPLICATIONS WORKING GROUP
R.J. HUNG, Univ. of Alabama, School of Science, *Huntsville, Alabama* 35814 (NAS 8-31321)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0004, AURORAL ALL-SKY CAMERAS FOR THE INTERNATIONAL MAGNETOSPHERIC SURVEY (IMS)
T.N. DAVIS, Univ. of Alaska, Geophysical Institute, *Fairbanks, Alaska* 99701

This grant will fund the construction of a number of all-sky cameras. These instruments will be important to the chains being set up for the International Magnetospheric Study (IMS).

SUPPORTED BY U.S. Natl. Science Foundation

5.0005, ERTS FOLLOW ON INVESTIGATION
L.D. GEDNEY, Univ. of Alaska, Geophysical Institute, *Fairbanks, Alaska* 99701 (NAS 5-20803)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0006, RELATIONS OF MICROPULSATIONS TO MAGNETOSPHERIC PLASMA STRUCTURE
R.R. HEACOCK, Univ. of Alaska, Geophysical Institute, *Fairbanks, Alaska* 99701

The 3 component induction magnetometer at Poker Flat research range north of College, Alaska plus the 2 component magnetometer and telluric current systems at College will be operated continuously. Micropulsation equipment at Macquarie Island, Ottawa and in Finland will also acquire data. Analysis of these results will be used to study the relationship of micropulsations to magnetospheric phenomena such as particle precipitation and magnetic storm commencement.

SUPPORTED BY U.S. Natl. Science Foundation

5.0007, A THEORETICAL STUDY OF THE SUBSTORM MECHANISM
J.R. KAN, Univ. of Alaska, School of Arts, *Fairbanks, Alaska* 99701

This research is aimed at developing two key elements of the substorm mechanism which are essential to the construction of a quantitative substorm model. This problem area is centered on the consequences of an earthward plasma flow along the convergent high- latitude field lines. This general problem can be reduced to three problems which are of fundamental importance in substorm physics. They are (A) the relationship between the energy of precipitating electrons and the upward field-aligned current, (B) the acceleration of auroral electrons by parallel electric fields and (C) the cause of an initial enhancement of field-aligned currents. The first two problems are amendable to theoretical treatment, and will be formulated within the framework of Vlasov equations; the third problem will be studied by analyzing coordinated observational data.

SUPPORTED BY U.S. Natl. Science Foundation

5.0008, ANALYSIS OF DATA FOR ERTS FOLLOW ON INVESTIGATION
P.C. LENT, Univ. of Alaska, State Coop. Wildlife Res. Unit, *Fairbanks, Alaska* 99701 (NAS 5-20915)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0009, OPERATION OF A PAIR OF IONOSONDES NEAR MAGNETIC LATITUDE 76 DEGREES FOR STUDIES OF THE MAGNETOSPHERIC CLEFT
E.M. WESCOTT, Univ. of Alaska, Geophysical Institute, *Fairbanks, Alaska* 99701

This grant funds the operation of two ionosondes near the Northern Polar Cusp. This region is of particular interest to magnetospheric physicists. Ionosondes are capable of giving information on the location of the Cusp as a function of time of day and season. It is important to the International Magnetospheric Study (IMS) that these facilities be continued.

SUPPORTED BY U.S. Natl. Science Foundation

5.0010, THEORETICAL STUDIES OF ACQUISITION OF RADIOACTIVE TRANSFER
B.M. HERMAN, Univ. of Arizona, School of Liberal Arts, *Tucson, Arizona* 85721 (NSG 5046)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0011, A WIND TUNNEL INVESTIGATION OF MICROPHYSICAL PROCESSES IN ATMOSPHERIC CLOUDS AT TEMPERATURES ABOVE AND BELOW 0 DEGREES C
H.R. PRUPPACHER, Univ. of California, Graduate School, *Los Angeles, California* 90024

Three unique and closely integrated facilities: a vertical wind tunnel, a walk-in cold chamber, and a long vertical shaft (UCLA rain shaft) have been adapted to research on a broad range of cloud physics problems.

This research will extend our investigations on the hydrodynamic behavior of water drops and ice cyrstals under free fall conditions and our ice nucleation studies. Special emphasis shall be given to studying experimentally and theoretically the rate of evaporation of ice crystals and supercooled large and small drops and to studying the rate of growth of ice crystals by collision with supercooled water drops and/or with other ice crystals in the presence and absence of an external electric field and charges on drops and crystals. These studies shall be complimented by a recently developed theoretical method to solve the complete Navier-Stokes equation of motion for viscous flow past spheres and oblate spheroids. This method shall be used to determine the flow characteristics past a cylindrically shaped body. With these characteristics known, the efficiency with which a columnar shaped ice crystal collides with a spherical water drop, and the effect of forced convection on the evaporation rate of a columnar shaped ice crystal shall be computed.

SUPPORTED BY U.S. Natl. Science Foundation

5.0012, DEVELOPMENT OF TECHNIQUES TO SEPARATE DIEZOMAGNETIC SIGNALS OF SEISMIC ORIGIN
UNKNOWN, Univ. of California, Graduate School, *Los Angeles, California* 90024 (NCA 2-90503)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0013, EARTHQUAKE HAZARDS REDUCTION, SOUTHWESTERN VENTURA COUNTY
D.N. MORTON, U.S. Dept. of the Interior, Geological Survey, *Menlo Park, California* 94025

States to which project pertains: California.

Short-term goals (2-3 years): 1) Photointerpretation and field mapping of Quaternary stratigraphic units in the Oxnard Plain and adjacent foothills utilizing stratigraphic-geomorphic criteria and soil development. 2) Correlation of Quaternary deposits by means of chemical tephrochronology (trace- and minor-element analyses of volcanic glass from interbedded ashes and tuffs). 3) Mapping of Quaternary faults utilizing (1) and (2) above, as well as a compilation of existing data on surface and subsurface geology, structure and geophysical data. 4) Dating of Quaternary faults utilizing relative and absolute age (radio - carbon and amino-acid racimization) data. 5) Photomapping of landslides in foothills surrounding Oxnard Plain.

Long-term goals (4-6 years). 6) Typing of Quaternary stratigraphic units with respect to seismic response (shear wave velocities, liquefaction potential). 7) Development of geologic hazards zonation maps for the study area on the basis of (1-6) above.

SUPPORTED BY U.S. Dept. of Interior - Geological Survey

5.0014, SOUTH SANTA ANA BLOCK AREA
V.R. TODD, U.S. Dept. of the Interior, Geological Survey, *Menlo Park, California* 94025

States to which project pertains: California.

1) Review and synthesis of existing historic, seismic, geologic, and geodetic records of all faults with known or suspected late Quaternary activity. 2) Study of satellite and high-altitude (1:90,000 to 1:230,000 scale) photography and other imagery for linear and other structural features that appear to reflect late Quaternary tectonic activity. 3) Study of known or suspected young faults by intermediate scale air photos (including low-sun-angle photos) and trenching. Determination for each active fault of length, width of hazardous zone, distribution and nature of adjacent landslides, character, rate, and chronology of past displacements from historic slip events, and late Quaternary stratigraphic and geomorphic record. 4) Compilation of a bedrock geologic map at a scale of 1:125,000.

SUPPORTED BY U.S. Dept. of Interior - Geological Survey

5.0015, EARTHQUAKE HAZARDS REDUCTION-CENTRAL VENTURA COUNTY
R.F. YERKES, U.S. Dept. of the Interior, Geological Survey, *Menlo Park, California* 94025

States to which project pertains: California.

1) Review and synthesis of existing historic, seismic, geologic, geodetic, and marine geophysical records of all faults with known or suspected late Quaternary activity. 2) Study of satellite and high altitude photography or other imagery for linear and other structural features that appear to reflect late Quaternary tectonic activity. 3) Study of known or suspected young faults by intermediate-scale air photos, trenching, drilling, geophysical surveys, seismic and geodetic networks, hydrologic studies, and marine geophysical studies. Determination for each active fault: length and width of hazardous zone, distribution and nature of adjacent landslides, character, rate, and chronology of past displacements from historic slip events, dendrochronology, and late Quaternary stratigraphic and geomorphic record. 4) Compilation of bedrock geologic map at suitable scale. Landslides will be mapped by photointerpretation, supplemented by field checks; consolidated deposits will be classified and mapped. These data will form principal basis for assessing seismic response and seismic zonation maps.

SUPPORTED BY U.S. Dept. of Interior - Geological Survey

5.0016, ALL-SKY IMAGING SPECTROPHOTOMETER
S.B. MENDE, Lockheed Aircraft Corporation, *Palo Alto, California* 94304

This supplement to GA-42209 will be used to field test the All-Sky Imaging Spectrometer in Ft. Churchill, Canada. The data obtained will be analyzed to study the dynamic behavior of the aurora at sensitivity levels not previously achievable with the field of view obtainable by this equipment.

SUPPORTED BY U.S. Natl. Science Foundation

5.0017, ANALYSIS OF SATELLITE DATA ON AURORAL HELIUM IONS
R.D. SHARP, Lockheed Aircraft Corporation, *Palo Alto, California* 94304

This is a program for the analysis of data from the energetic ion mass spectrometer experiment on the satellite 1971-089A. The experiment measures ions in the energy range 0.7 to 13 keV per-unit-charge and separates the ionic components on the basis of mass-per-unit-charge. The central focus of the investigation will be the utilization of the helium-ion component of the auroral ion fluxes as test probes for the investigation of various magnetospheric processes which may be charge or mass dependent. To pursue this end, a study will be conducted of the morphology of the precipitating helium ions in the keV range and a comparison will be made primarily with precipitating auroral and ring current protons.

SUPPORTED BY U.S. Natl. Science Foundation

5.0018, POLYCHLORINATED BIPHENYLS IN SEDIMENTS
UNKNOWN, Stanford University, Graduate School, *Palo Alto, California* 94305 (NCA 2-45501)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0019, JOINT ANALYSIS OF SATELLITE DATA STUDY
C.E. MCILWAIN, Univ. of California, Graduate School, *San Diego, California* 92038 (NAS 8-31145)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0020, TWO AND THREE DIMENSIONAL CHEMICAL/DYNAMICAL MODELS OF THE STRATOSPHERE AND MESOPHERE
UNKNOWN, Calif. State Univ. & Colleges, Graduate School, *San Jose, California* 95114 (NCA 2-75509)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0021, RADAR-AURORAL STUDIES DURING THE INTERNATIONAL MAGNETOSPHERIC STUDY
B.B. BALSLEY, U.S. Dept. of Commerce, Natl. Oceanic & Atmos. Admin., *Boulder, Colorado* 80302

This experimental program is designed to examine the auroral E- region with state-of-the-art VHF radar techniques. The investigations will be centered on the magnetic meridian passing through College, Alaska and will examine an area of about 400 x 750 Km extending from slightly south of College to the northern Alaskan coast. The contribution to the International Magnetospheric Study would lie in two major areas: first, on a continuous basis, the location, extent, and intensity of the E-region irregularities embedded in the auroral electrojet will be monitored. The data will complement concurrent magnetometer data and will show the fine-scale spatial structure of the electrojet current system(s) with spatial and temporal resolution not possible from the magnetometer data.

SUPPORTED BY U.S. Natl. Science Foundation

5.0022, ERTS FOLLOW-ON INVESTIGATION
P. KREBS, Univ. of Colorado, Graduate School, *Boulder, Colorado* 80302 (NAS 5-20948)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0023, ERTS FOLLOW-ON INVESTIGATION
H. MACDONALD, Univ. of Colorado, Graduate School, *Boulder, Colorado* 80302 (NAS 5-20810)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0024, SOLAR ACTIVITY AND LARGE SCALE CIRCULATION OF THE EARTH'S ATMOSPHERE
W.O. ROBERTS, Univ. of Colorado, Graduate School, *Boulder, Colorado* 80302

Studies of the short-term connections of strong solar and/or geomagnetic activity with the circulation of the lower stratosphere and upper troposphere will be conducted. The purpose will not be to seek further to build the evidence for the reality of these connections, but rather to try to make critical tests between the different working hypotheses that have been advanced to explain the observed correlations. An attempt will be made to examine why different workers in this field have found somewhat different 'lag times' between solar or geomagnetic activity events and the presumably related meterological phenomena.

SUPPORTED BY U.S. Natl. Science Foundation

5.0025, THEORETICAL STUDIES OF PLANETARY ATMOSPHERES
G.E. THOMAS, Univ. of Colorado, Graduate School, *Boulder, Colorado* 80302

This grant is a renewal of National Science Foundation grant GA- 16290. The work funded by this action will encompass theoretical studies of the effects in the high atmospheres of the earth and other planets of particle bombardment and electric fields and the appearance of the atmospheres under solar ultraviolet illumination.

The topics to be studied can be listed under the following headings: 1. Electron penetration using the transport equations. 2. Ionospheric conductivity. 3. Exospheric response to geomagnetic heating. 4. Spectroscopic ratios and electron energy characteristics. 5. Excitation of minor constituents in aurora. 6. Radiative transfer in aurorae of finite extent. 7. Telescopic appearance of planetary atmospheres in the U.V. 8. Aurora on Jupiter.

SUPPORTED BY U.S. Natl. Science Foundation

5.0026, GEOMAGNETIC OBSERVATORIES
J.D. WOOD, U.S. Dept. of the Interior, Geological Survey, *Denver, Colorado* 80225

States to which project pertains: Alaska; Arizona; California; Colorado; Guam; Hawaii; Puerto Rico; Texas; Virginia; Washington.

The Survey operates ten magnetic observatories in the U.S., one in Puerto Rico and one on Guam. These observatories measure and record values and variations in the magnetic field components. The observatory network is presently being converted from classical observatory systems to modern digital proton-flux gate systems that record fluctuations in declination, horizontal and vertical intensities, and absolute values of the total field.

Data collected at these observatories including recordings, absolute values, magnetic storm reports, magnetic activity indices (K- indices) and selected magnetic phenomena reports are deposited in the World Data Centers.

SUPPORTED BY U.S. Dept. of Interior - Geological Survey

5.0027, COORDINATED INVESTIGATION OF HIGH LATITUDE ELECTRON PRECIPITATION USING BALLOON, SATELLITE AND SURFACE INSTRUMENTATION
J.R. BARCUS, Univ. of Denver, School of Arts, *Denver, Colorado* 80210

This grant will support a research program involving coordinated efforts using balloon, satellite, and surface instrumentation for the investigation of a particular class of magnetospheric electron precipitation events. These events occur in the polar cap region (greater than or equal to 70 degrees geomagnetic), and they are due to processes in the earth's magnetotail which take place at distances well beyond those associated with effects at auroral latitudes.

The proposed program has been motivated by the results of studies of ionospheric absorption of cosmic radio noise observed during the night-time at high magnetic latitudes. Characteristically, these nighttime absorption events are associated with magnetospheric substorms, yet the events tend to be more isolated in time, having rapid onsets (a few minutes rise time) and of rather short duration (approximately tens of minutes).

The principal aim of the proposed research then is to obtain more precise information on a relatively neglected phase of substorm evolution. Specifically, the following answers will be sought: What physical changes are taking place in the magnetotail which produce energetic electron precipitation into the polar cap region, and how does this knowledge contribute to the overall picture of the dynamics of the magnetospheric substorm?

SUPPORTED BY U.S. Natl. Science Foundation

5.0028, EXPERIMENTAL TURBULENCE MODELING
UNKNOWN, Colorado State University, Graduate School, *Fort Collins, Colorado* 80521 (NCA 2-65502)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0029, SPECTROSCOPIC MEASUREMENT OF UPPER ATMOSPHERIC SODIUM
C.R. BURNETT, Florida Atl. University, School of Science, *Boca Raton, Florida* 33432

This amendment continues a program of measurements of upper atmospheric atomic sodium content. The measurements are carried out with a scanning, triple Fabry-Perot interferometer (Pepsios). Observational sites will be Boca Raton, Florida in the winter and Kitt Peak, Arizona or Fritz Park, Colorado during the summer when atmospheric conditions at Boca Raton are generally unsuitable.

SUPPORTED BY U.S. Natl. Science Foundation

5.0030, GENERAL CIRCULATION IN THE STRATOSPHERE AND MESOPHERE
D.W. BLAKE, Florida State University, School of Arts, *Tallahassee, Florida* 32306

A two year study is proposed to investigate the general circulation of the stratosphere and mesophere, with primary consideration given to the altitudes above 30 km. A multi-layer, quasi-geostrophic model will be used. Photochemistry, including nitrogen and hydrogen reactions as well as purely oxygen reactions, and radiative processes will be incorporated. The spectral method will be used to integrate the equations with the atmosphere initially in radiative-photochemical equilibrium.

SUPPORTED BY U.S. Natl. Science Foundation

5.0031, INSTRUMENTATION FOR TORNADO ELECTROMAGNETIC EMISSION DETECTION
UNKNOWN, Georgia Inst. of Technology, Graduate School, *Atlanta, Georgia* 30332 (NAS 5-20956)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0032, GUAM OBSERVATORY
W. JACOBS, U.S. Dept. of the Interior, Geological Survey, *Guam* 96630

States to which project pertains: Mariana Islands.

The GS operates and maintains a national and world-wide network of observing and reporting systems. Included are facilities and systems for describing, mapping and charting the earth, utilizing seismological and geomagnetic science and technology, and conducting related research and development. Guam observatory provides seismological data which are used to describe the

occurrence of earthquakes and their effects on lives and property, and to monitor and record vibrations in the earth caused by earthquakes and large man-made disturbances. This information contributes to a better understanding of the earth's crust, mantle, and core; and of the nature of seismic hazards and risk. Magnetic data are used to update periodically regional and world magnetic charts, and to determine correction factors applicable to magnetic field measurements made by land, marine, and airborne magnetic survey parties. Additionally, this information supports studies in ionospheric physics, radio propagation phenomena, electrical conductivity, the composition of the core and mantle of the earth, and interplanetary space. Knowledge of magnetic declination and its secular change is required as input to the compilation of all sea and air navigation charts for use by marine and aircraft navigators and by public and private surveyors.

The Guam observatory will continue to provide seismic data to the TWS program and to the NEIS for the Early Earthquake Reporting Plan. Operation and maintenance of the WWSSS will continue. Guam observatory has been selected by ARPA to receive one of the Seismic Research Observatories - a broad band borehole three component seismometer with digital and conventional recording. The SRS system is planned for installation in early 1975. The present geomagnetic program will be continued.

SUPPORTED BY U.S. Dept. of Interior - Geological Survey

5.0033, CHARTS OF THE TROPICAL UPPER TROPOSPHERIC CIRCULATION
J.C. SADLER, Univ. of Hawaii, School of Arts, *Honolulu, Hawaii* 96822

The purpose of this work is to compile and integrate the long term mean wind data from fixed meteorological stations and jet aircraft flights over the global tropics and then analyze the monthly mean charts for wind direction and speed at the 200 mb level. The analyses will be reduced and published with an appropriate narrative. Data sources will include aircraft reports (Pireps) and long term monthly mean rawin data.

SUPPORTED BY U.S. Natl. Science Foundation

5.0034, SUPPORT FOR GSFC REMOTE TERMINAL CONNECTING THE PURDUE/LARS COMPUTER
T.L. PHILLIPS, Purdue University, Graduate School, *Lafayette, Indiana* 47907 (NAS 5-20922)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0035, SERVICES IN SUPPORT OF LARS REMOTE DATA TERMINAL
T.L. PHILLIPS, Purdue University, Graduate School, *Lafayette, Indiana* 47907 (NAS 6-2613)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0036, EFFICIENT DETECTION, ANALYSIS AND CLASSIFICATION OF LIGHTNING RADIATION FIELDS
R.O. HARGER, Univ. of Maryland, School of Engineering, *College Park, Maryland* 20740 (NSG 5048)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0037, INDIRECT SENSING OF ATMOSPHERIC STRUCTURE
O.E. THOMPSON, Univ. of Maryland, School of Engineering, *College Park, Maryland* 20740

The purpose of this research is to investigate possible new or better uses of satellite measured radiance from the earth-atmosphere system to infer atmospheric thermal structure. The potential of this research centers around the observation that certain carefully selected linear combinations of satellite measured spectral radiance appear to be more powerful in resolving the temperature structure of the atmosphere than any single radiance value. By replacing sets of spectral radiances with sets of carefully selected functions of radiance, one may be able to improve the accuracy and resolution of temperature profile retrievals and may be able to develop useful radiance-indices of certain local features such as tropospheric stability and stability change, tropopause height, cloud top height, etc.

SUPPORTED BY U.S. Natl. Science Foundation

5.0038, ANALYSIS OF GEOMAGNETIC INDICES
P.F. FOUGERE, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts*

AF function - this work is relevant to Air Force functions of communications, surveillance and detection. Deficiency - systems such as OTH radars and HF communications (e.g. 440l and SAC communication circuits) are adversely affected by geomagnetic storms. Objective - to determine the properties of a high resolution method of spectral analysis called the maximum entropy method (MEM) as a prediction technique for magnetic activity. How research contributes - improves spectral resolution and prediction capabilities.

The maximum entropy method is to be investigated analytically and by conducting a series of computer experiments on both geophysical time series related to magnetic activity and on ideal signals constructed to determine specific features of the method, such as resolution in the presence of high noise. As a by-product of the maximum entropy method of spectral analysis, a prediction of the next value of the input time series can be made once the spectrum has been determined.

Supporting agency address information: AF Cambridge Research Laboratories PH

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0039, STRATOSPHERIC DYNAMICS
N.W. ROSENBERG, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts*

AF function - environmental impact statements of high altitude Air Force operations. Deficiency - current or anticipated Air Force operations in the stratosphere may deposit harmful material and it is important to be able to assess the dispersion and residence time of such material in the stratosphere. Research - the necessary high resolution techniques for measuring turbulent transport and lifetime will be developed and tested on balloon platforms. Models of aircraft and missile wake dispersion will be developed. How research contributes - models will be developed from the experimental observation to predict the dispersion, spreading and lifetime of aircraft and missile exhaust products in the stratosphere.

In order to obtain experimental data on possible turbulence, three main techniques are employed- (a) chemical smoke trails formed vertically by rockets which give the vertical profiles of horizontal winds, (b) balloon borne sensors giving temperature and microscale vertical wind components (and in general 3-D winds) and (c) aircraft wake studies. The resulting data (consisting for the most part of time lapse photographs from several locations simultaneously) are triangulated and measured (assisted by several computerized data reduction techniques) and these data are further reduced to give wind shears, Richardson numbers (criteria for turbulence instability) and energy spectra (giving turbulence information). The resulting estimates of the vertical turbulent transport effects will be fed into dynamic models in order to learn the expected impact from vehicle emissions.

Supporting agency address information: AF Cambridge Research Laboratories LK, L. G. Hanscom AFB, Bedford, Mass 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0040, POLAR VLF/LF PROPAGATION
J.P. TURTLE, U.S. Air Force, Cambridge Research Labs., *Bedford, Massachusetts* 01730

AF function - an analysis of propagation data and noise level statistics is needed for an evaluation of the predicted performance of survivable communication systems (MEECN) in the polar region. Deficiency - lack of sufficient VLF/LF data and understand-

ing to adequately predict the performance of survivable communications systems such as 487l, 616a and MEECN in a polar environment. Objective - during FY75 measurements of the phase and amplitude of the signal from transmitters at a variety of azimuths from Thule will be made. Quiet day curves will be developed for use in defining propagation anomalies. Ambient atmospheric noise level measurements will be initiated and techniques for analyzing and interpreting these data will be developed. How research contributes - provides information as to the variability of the signal-to-noise ratio of a VLF/LF signal propagating into or through the polar regions. This is an important input to RADC, both for the 487l system and MEECN and to ESD for the 616a system.

Propagation data will be obtained at the AFCRL Geopole Observatory using VLF/LF phase tracking receivers. The output of these receivers, calibrated in absolute units, will be recorded on a digital magnetic tape system for processing and analysis on the AFCRL CDC 6600 computers. During FY75, the equipment for making the ambient noise level measurements will be installed at Thule, and data processing software will be developed on the AFCRL computer. During FY76, the propagation data will be analyzed to investigate the signatures of energetic particle events. The noise data will be analyzed to determine diurnal and seasonal changes and disturbance effects. The results of the propagation and noise level data analysis will be combined to determine the variability of signal-to-noise ratios under quiet and disturbed conditions.

Supporting agency address information: AF Cambridge Research Laboratories PH, L. G. Hanscom AFB, Bedford, Mass 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0041, COOPERATIVE INCOHERENT SCATTER STUDIES AT MILLSTONE HILL
J.V. EVANS, Mass. Inst. of Technology, Lincoln Laboratory, *Lexington, Massachusetts* 02173

The research done at this facility is unique because of its location. The capability of this facility to determine electric fields near the plasmapause will contribute not only to ionospheric research in general but can be expected to play an important role in the International Magnetospheric Study (IMS).

SUPPORTED BY U.S. Natl. Science Foundation

5.0042, DESIGN, DEVELOP AND FABRICATE A PHOTOELECTRON SPECTROMETER
W. REIDY, Visidyne Incorporated, *Woburn, Massachusetts* 01801 (F19628-71-C-0223)

AF function - target detection, acquisition, tracking, and communications. Deficiency - unreliable and presently unpredictable operation during the blackout periods associated with atmospheric nuclear detonations and with solar storms. Research - photoionization cross-sections of atmospheric gases to specific products. How research contributes - results used in computer code modelling and other studies to predict extent and severity of blackouts. This work is the design, development and fabrication of a photoelectron spectrometer to measure the specific cross-sections for photoionization. The presently available total cross-sections do not give information about product ions. The calculations are inaccurate and incomplete because the energy contained in excited products is not properly included. The creation of these products to serve as initial conditions for reaction rates is also not included. Present spectrometers do not provide the information needed for this problem and thus a spectrometer specifically designed for this aeronomical information is required.

Supporting agency address information: AF Cambridge Research Laboratories LK, L. G. Hanscom Field, Bedford, Mass 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0043, EFFECT OF BEAM-PLASMA INTERACTIONS IN HIGH-LATITUDE IONOSPHERE
E.G. FONTHEIM, Univ. of Michigan, School of Engineering, *Ann Arbor, Michigan* 48106

The effect of beam-plasma interactions on the energetics and the dynamics of the high latitude topside ionosphere will be studied. There are two aspects to this investigation: (1) Calculation of the energy input into the background plasma due to beam-plasma interactions, including nonlinear effects, using measured precipitation fluxes and ambient parameters from the ISIS II satellite and the Chatanike backscatter facility; and (2) Calculation of temperature, density, and flux profiles for the calculated heat input using measured densities and temperatures as boundary values.

SUPPORTED BY U.S. Natl. Science Foundation

5.0044, LABORATORY TESTS AND DEVELOPMENT OF MASS SPECTROMETER SUBSYSTEMS
UNKNOWN, Univ. of Michigan, Graduate School, *Ann Arbor, Michigan* 48104 (NAS 5-20939)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0045, PHOTOGRAPHY STUDY OF INFRARED AIRGLOW FROM C-990 AIRBORNE LABORATORY DURING SPACE SHUTTLE SIMULATION
A.W. PETERSON, Univ. of New Mexico, School of Arts, *Albuquerque, New Mexico* 87106 (NSG 2052)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0046, PHOTOELECTRIC STUDIES OF THE NIGHT GLOW
J.L. WEINBERG, State University of New York, Graduate School, *Albany, New York* 12203 (NSG 7093)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0047, OCEAN DYNAMICS REMOTE SENSING STUDIES
W.J. PIERSON, City University of New York, School of Liberal Arts, *New York, New York* 10031 (04-4-158-11)

Dr. W. J. Pierson, Jr. and associates have been working on applications of aircraft or space borne remote sensors for measuring dynamic ocean surface features. First by aircraft and then by spacecraft (SKYLAB), CUNY has demonstrated that radar backscatter can be correlated to surface winds and wave conditions on the ocean surface. The first final report utilizes the results of SKYLAB A data to confirm the use of active and passive microwave data to estimate surface wind speeds. SEASAT-A instrumentation is described and the radar backscatter is modeled analytically to determine the expected wind speed and direction. Procedures to scan and provide the meteorological analysis at the planetary boundary layer are given. A procedure to integrate SEASAT-A data into numerical prediction models is suggested. Applications of SEASAT data for pressure field and wind data in tropical storms and hurricanes are given.

The second final report describes an ocean wave spectral model developed at CUNY. Wind field, wave growth, dissipation, propagation, and map model discussions are included in the report. A computer program for wave hindcasting and other outputs for the model are presented. The model is being used operationally at the U.S. Navy Fleet Numercial Weather Facility as a wave forecasting tool and also for generating wave climatology in the North Atlantic Ocean.

SUPPORTED BY U.S. Dept. of Commerce - N.O.A.A.

5.0048, INVESTIGATION OF THE PLANETARY BOUNDARY LAYER IN RELATION TO LARGE SCALE ATMOSPHERIC DYNAMICS
M.I. HOFFERT, New York University, Graduate School, *New York, New York* 10003 (NSG 5045)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0049, RADIATIVE ENERGY TRANSFER IN GASES
R.D. CESS, State University of New York, School of Engineering, *Stony Brook, New York* 11790

The study of infrared radiative energy transfer in gases will be continued. The overall program proposed will deal with the incorporation of spectroscopic information into the radiative equation, so as to describe radiative energy transfer within real gases. Specifically, a general formulation for radiative transfer due to water vapor will be developed to render it applicable to energy transfer situations other than the terrestrial global energy balance. The effects of H2O-CO2 mixture will be included so as to enable application of the model to combustion systems and cooling tower plumes. The effect of increasing aerosol concentration of the Junge layer, as the results of man's activity, on global climate changes will be investigated. In particular, changes in the surface temperature of the earth due to the scattering of the sun's radiation, and the attendant increased infrared opacity of Junge layer, both due to increased aerosol concentration, will be examined. The model will also be employed to investigate the causes of differences between model atmospheric calculations and spacecraft data for Venus.

SUPPORTED BY U.S. Natl. Science Foundation

5.0050, MONITORING STREAM SEDIMENT LOADS THROUGH MULTISPECTRAL AERIAL PHOTOGRAPHY
T.M. LILLISAND, State University of New York, School of Forestry, *Syracuse, New York* 12224 (NYZ-107-0-008)

OBJECTIVE: To develop a multispectral photographic remote sensing system to facilitate measurement of sediment production in forested areas.

APPROACH: Simultaneous acquisition of multiple exposure aerial photographs, in situ reflectance measurements, and suspended solids samples will be made. Photographs will be procured with a 4-camera bank of motor-driven 70 mm Hasselblad cameras. Microdensitometric measurements at image point positions associated with each ground sampling point will be extracted from the photography. Models will be developed enabling estimations of sediment concentrations from image density observations. Concentration maps will be generated using electronic image analysis equipment.

SUPPORTED BY U.S. Dept. of Agriculture - C.S.R.S.

5.0051, INVESTIGATION OF D-REGION BACKSCATTERING PROCESSES 11054-GS
W.A. FLOOD, Univ. of North Carolina, School of Engineering, *Raleigh, North Carolina* 27600 (DAHC04-74-G-0161)

To conduct a comprehensive investigation of the accuracies of ground-base radio techniques for sounding the motions and electron densities in the ionospheric D-region between 6 Km and 110 Km. Upper air winds affect rocketry (BRL, MICOM, ASL) and ionospheric drifts affect communications (e.g., VLF communications program). This ground-based technique for wind measurement in the 60-110 Km interval could replace the wind measurements of the cooperative meterological rocket network with obvious advantages.

Specific studies include- a) Assessment of the validity of the randomly phased angular spectrum approximaton as it applies to HF radio wave ionospheric drift measurements. B) Determination of the amplitude and distribution of d-region echoes as a functionof altitude and pulse length. C) Investigation of the presence and cause of orthogonally polarized D-region echoes. D) Determination of the cone angle of arrival of D-region echoes and correlation of the cone angle measurements with the orthogonally polarized D-region echoes.

Supporting agency address information: OCRD Army Research Office Box CM, Duke Station, Durham, NC 27706

SUPPORTED BY U.S. Dept. of Defense - Army

5.0052, CLOSE GRID GEODYNAMIC SATELLITE MEASUREMENT SYSTEM DEFINITION
I.I. MUELLER, Ohio State University, School of Mathematics, *Columbus, Ohio* 43212 (NAS 8-31195)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0053, ERTS FOLLOW ON INVESTIGATION
J.W. ROUSE, Texas A & M University System, School of Engineering, *College Station, Texas* 77843 (NAS 5-20796)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0054, TRACE CONTAMINANT CONTROL USING RADIOFREQUENCY AND DC ELECTRICAL DISCHARGES
UNKNOWN, Texas A & M University System, Graduate School, *College Station, Texas* 77843 (NCA 2-73501)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0055, ISIS II ION MASS SPECTROMETER DATA ANALYSIS AND INTERPRETATION STUDY
J.H. HOFFMAN, Univ. of Texas, Graduate School, *Dallas, Texas* 75230 (NSG 7107)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0056, MAGNETOSPHERE-IONOSPHERE COUPLING STUDIES USING THE ISIS POLAR ORBITING SATELLITES
D.M. KLUMPAR, Univ. of Texas, Graduate School, *Dallas, Texas* 75230

This research through use of ISIS II data will be addressed to the physical processes which contribute to the electrodynamic coupling between the earth's magnetosphere and its ionosphere. This work draws upon a large body of already existing data for many of the results.

SUPPORTED BY U.S. Natl. Science Foundation

5.0057, FURTHER TESTS OF PLANT CANOPY REFLECTANCE MODELS AND INVESTIGATION OF NON-LAMBERTIAN PROPERTIES OF PLANT CANOPIES
E.W. LEMASTER, Pan Amer. University, Graduate School, *Edinburg, Texas* 78539 (NSG 9015)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0058, STUDY OF SOLAR WIND INTERACTIONS
A.J. DESSLER, Rice University, School of Engineering, *Houston, Texas* 77001 (F19628-73-C-0120)

AF function - satellite orbit prediction and communications. Deficiency - outbursts of solar plasma cause perturbing drag on satellites and disrupt communication networks. Research - employ experimental and theoretical studies to the interaction of the solar wind with the magnetosphere. How research contributes - atmospheric density changes at satellite altitudes of interest to the AF are closely correlated to fluctuations of the earth's magnetic field. Geomagnetic storms often interrupt AF communication nets. Prediction of magnetic field variations is a first step to improving predictions of satellite drag and radio interference. Investigations are being conducted on the interaction between the interplanetary medium and the magnetosphere in order to understand the nature of the interaction and the phenomena it produces. Topics of interest are the effect of rapid time-variations in interplanetary parameters on the critical plasma sheet parameters of geometry, density and energy spectrum, and the relationship between events occurring in the outer magnetosphere and Birkeland currents in the ionosphere. The objective of this study is to develop a magnetospheric model capable of predicting geomagnetic activity in terms of the indicator KP.

Supporting agency address information: AF Cambridge Research Laboratories PH, L. G. Hanscom Field, Bedford, Mass 01730

SUPPORTED BY U.S. Dept. of Defense - Air Force

5.0059, UV TRANSMITTANCE EXPERIMENTATION
D.G. PITTS, Univ. of Houston, School of Optometry, *Houston, Texas* 77004 (NAS 9-14384)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0060, APPLICATIONS OF CARTAN'S THEORY OF DIFFERENTIAL FORMS TO PROBLEMS IN TURBULENCE
UNKNOWN, Univ. of Houston, Graduate School, *Houston, Texas* 77004 (NCA 2-95502)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0061, INTERACTION OF THE LANTHANUNS WITH ANORTHITE UNDER HYDROTHERMAL CONDITIONS
C.T. STUBBLEFIELD, Texas A & M University System, Graduate School, *Prairie View, Texas* 77445 (NSG 9018)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0062, ANALYZE SOLID-ROCKET EFFLUENTS FOR ALUMINUM, SILICON AND OTHER TRACE ELEMENTS BY NEUTRON ACTIVATION ANALYSIS
A.K. FURR, Virginia Polytechnic Institute, School of Engineering, *Blacksburg, Virginia* 24061 (NSG 1119)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0063, WAVE REFRACTION CALCULATIONS
D.L. HARRIS, U.S. Army, Coastal Engineering Res. Ctr., *Fort Belvoir, Virginia* 22060

Objectives: To prepare and make available to Corps field offices a computer program which will compute and plot refraction diagrams for a specified depth field, or tell the operator that the algorithm being used is not reliable for the specified conditions; to develop procedures for computation of wave refraction for conditions in which the available procedures are not applicable. These will be described in the Coastal Engineering Manual and programs will be available to CE offices.

Approach: Aerial photography or radar imagery will be used to determine the actual refraction patterns in the field for a few situations in which the available procedures are believed to be adequate and a few situations in which they are believed to be clearly inadequate. Several computer programs for refraction calculations will be used to calculate refraction diagrams for the selected cases to document the magnitude of the problem. Laboratory experiments, guided by theoretical considerations, will be used to determine and document the conditions in which the available programs give satisfactory results. The accepted computer programs will be modified to produce diagnostic messages, warning the engineer when the programs are used outside their domains of validity. At least one marginal zone in which the calculations are considered useful but inadequate will be delineated. A more penetrating theoretical analysis will be conducted to extend the range in which satisfactory refraction calculations can be carried out. The results of this study will be checked against aerial photography, radar imagery, or laboratory studies as indicated by the results of the analysis. Major efforts will be: (1) Preparation of a report which reviews the wave refraction procedures commonly used, with specific reference to the classes of problems for which solutions can be readily obtained and conditions under which the usual procedures will not give good results. This report will indicate the areas where present methods are suitable and indicate areas where research is needed. (2) Preparation of a computer program which will provide acceptable solutions to a wide range of refraction problems, and warn the user when acceptable solutions are not obtained. This program will be made available for field use on a Corps' computer. (3) Preparation of reports and computer programs which extend the capability of presently available procedures. (Text Abridged)

SUPPORTED BY U.S. Dept. of Defense - Army

5.0064, STRATOSPHERIC LONG WAVES
C.B. LEOVY, Univ. of Washington, School of Arts, *Seattle, Washington* 98105 (NSG 5039)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

5.0065, EXPERIMENTAL AND THEORETICAL STUDIES OF BETAVOLTAIC ENERGY CONVERSION
L.C. OLSEN, Univ. of Washington, Graduate School, *Seattle, Washington* 98105

The research program will involve advanced betavoltaic studies of semiconductive junction devices with emphasis on evaluating their potential for nuclear batteries in the microwatt to milliwatt range. Theory for betavoltaic energy conversion will be refined. Diffused junction devices based on semiconductors with large band gaps will be fabricated and characterized. These devices will be coupled to promethium (Pm) and tritium beta sources. Minority carrier properties and junction parameters will be determined and coupled with betavoltaic studies to define optimum device parameters for power source performance. The effects of beta irradiation upon fundamental semiconductor properties will be studied. A model accounting for these effects will be formulated and used to examine long term power source performance. An effort to increase the betavoltaic power conversion efficiency will be undertaken from the present 4% to over 15% for junction devices coupled to Pm147, and from .02% to greater than 0.1% for tritium betavoltaic systems. These improvements would make possible Pm147 betavoltaic power sources characterized by much lower dose rates and/or longer lifetimes, and tritium-fueled batteries with power densities large enough for prosthetic applications. Research will concentrate on large, indirect band gap semiconductors for Pm 147 betavoltaics, and both indirect and direct gap materials for tritium studies. Initial efforts will involve III-V compounds and III-V ternary alloys, and thin film II-VI devices.

SUPPORTED BY U.S. Natl. Science Foundation

LIFE SCIENCES

Includes Life Sciences (general); Aerospace Medicine; Behavioral Sciences; Man/system Technology and Life Support; and Planetary Biology.

6.0001, STUDY ON AMINO ACID METABOLISM IN HIGHER PLANTS
UNKNOWN, Univ. of California, Graduate School, *Davis, California* 95616 (NAS 2-8685)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0002, STUDY OF LYMPHOCYTE HETEROGENEITY, MORPHOLOGICAL, AND FUNCTIONAL CORRELATIONS
R.R. RICH, Baylor University, Graduate School, *Waco, Texas* 76703 (NAS 9-14363)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

6.0003, ESTABLISHMENT OF A BIOMEDICAL APPLICATIONS TEAM
UNKNOWN, Univ. of Wisconsin, Graduate School, *Madison, Wisconsin* (NASW 2716)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

MATHEMATICAL AND COMPUTER SCIENCES

Includes Mathematical and Computer Sciences (general); Computer Operations and Hardware; Computer Programming and Software; Computer Systems; Cybernetics; Numerical Analysis; Statistics and Probability; Systems Analysis; and Theoretical Mathematics.

7.0001, DEVELOPMENT OF AN ISOLATION RESEARCH MODEL AND PARADIGM
J.G. ROGERS, Univ. of Alabama, School of Humanities, *Huntsville, Alabama* 35807 (NSG 2058)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

7.0002, DATA REDUCTION AND ANALYSIS OF ELECTRO-MAGNETIC FIELD OF IMP I
P.J. KELLOGG, Univ. of Minnesota, School of Liberal Arts, *Minneapolis, Minnesota* 55455 (NAS 5-20837)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

7.0003, INTELLIGENT SATELLITES AND THEIR APPLICATIONS
A. VANDAM, Brown University, Graduate School, *Providence, Rhode Island* 02912

This is a continuation of a project in distributed computing, using interactive computer graphics problems as a paradigmatic class of application programs. The major thrust of our proposed research is the investigation of facilities for efficient utilization of an interconnected set of dissimilar processors.

The primary aim is to explore the ways in which reconfigurable systems can be put to the use of significant applications employing intelligent satellites. We intend to apply what we have already learned about multi-level systems to lower levels--'flexible' hardware and instruction set design--and to higher levels--language extensibility and interconnected processor support. The three major areas to be investigated are: Interconnected Processing--Automatic module reallocation and data structure segmentation on host/sattellite configurations; Language Extensibility--The use of an extensible language for design of 'personalized' data and display structure primitives; Data Structure Specification--Automatic generation of data structure management routines based on user provided graphical definitions.

SUPPORTED BY U.S. Natl. Science Foundation

PHYSICS

Includes Physics (general); Acoustics; Atomic and Molecular Physics; Nuclear and High-energy Physics; Optics; Plasma Physics; Solid-state Physics; Thermodynamics and Statistical Physics. For Related Information See Also Engineering.

8.0001, IN-SITU HIGH-TEMPERATURE CONTROLLED-ATMOSPHERE ELECTRON MICROSCOPY TO STUDY NUCLEI FORMATION
UNKNOWN, Univ. of California, Graduate School, *Los Angeles, California* 90024 (NCA 2-90402)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

8.0002, DIAGNOSTIC TECHNIQUES FOR COMBUSTION MHD PLASMAS
S.A. SELF, Stanford University, School of Engineering, *Palo Alto, California* 94305

The research covers three areas of diagnostics related to combustion MHD plasmas, namely Langmuir probes, laser anemometry and infrared interferometry. The design and use of probes for local measurements of electron concentration in seeded combustion MHD plasmas will be investigated. Theoretical work on the use of Langmuir probes in flowing, atmospheric pressure plasmas will be directed towards extending the work of Clements and Smy to take account of the thermal boundary layer. The development of laser anemometry for high resolution measurements of the profiles of average velocity and turbulence intensity in MHD boundary layers will be continued. The effort will be directed to developing a transit-timing anemometer combined with digital correlation to facilitate measurements at low speed particle fluxes in the presence of noise generated by light scattered from channel surfaces. Far infrared interferometric techniques will be investigated for absolute measurements of electron concentration.

For this purpose a far infrared laser, optically pumped by a CO2 laser, will be developed. Initially measurements of moderate resolution will be made using Faraday rotation. Subsequently the use of finite- fringe interferometry for higher spatial resolution of electron concentration in boundary layers will be investigated.

SUPPORTED BY U.S. Natl. Science Foundation

8.0003, CALCULATION OF ROTATIONAL TRANSITION PROBABILITIES INDUCED BY COLLISION BETWEEN DIATOMIC MOLECULES
UNKNOWN, Stanford University, Graduate School, *Palo Alto, California* 94305 (NCA 2-45502)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

8.0004, CONCEPTUAL DESIGN STUDY OF GAS-CORE NUCLEAR REACTORS
M.L. STOENESCU, Princeton University, School of Engineering, *Princeton, New Jersey* 08540 (NSG 1129)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

SOCIAL SCIENCES

Includes Social Sciences (general); Administration and Management; Documentation and Information Science; Economics and Cost Analysis; Law and Political Science; and Urban Technology and Transportation.

9.0001, EFFECTIVE WAYS TO TRAIN JOURNALISM STUDENTS TO REPORT SCIENCE ACTIVITIES
UNKNOWN, Calif. State Univ. & Colleges, Graduate School, *San Jose, California* 95114 (NCA 2-75401)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

9.0002, TIDEWATER VIRGINIA AREA TRANSPORTATION SURVEY STUDY
J.C. FICHT, Norfolk State College, Undergraduate School, *Norfolk, Virginia* (NSG 1145)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

SPACE SCIENCES

Includes Space Sciences (general); Astronomy; Astrophysics; Lunar and Planetary Exploration; Solar Physics; and Space Radiation. For Related Information See Also Geosciences.

10.0001, DEVELOPMENT OF REFLECTING OPTICS SYSTEMS USED IN INFRARED ASTRONOMY
UNKNOWN, Stanford University, Graduate School, *Palo Alto, California* 94305 (NCA 2-45514)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0002, STUDY OF BIOLOGICAL EXPERIMENTS FOR THE VIKING MISSION
J.S. HUBBARD, Georgia Inst. of Technology, Graduate School, *Atlanta, Georgia* 30332 (NAS 1-13422)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0003, AN INVESTIGATION OF FRESNEL LENS UTILIZATION IN COLLECTING SOLAR ENERGY FOR POWER GENERATION
UNKNOWN, Ball State University, Graduate School, *Muncie, Indiana* 47306 (NCA 8-103)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0004, JOINT MEETING ON THE CHEMICAL EVOLUTION OF GIANT PLANETS
UNKNOWN, Univ. of Maryland, Graduate School, *College Park, Maryland* 20740 (NCA 2-20501)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0005, PARTICIPATION IN THE SCIENCE PLANNING FOR THE VIKING 1975 MISSIONS IN THE AREA OF RADIO SCIENCE
I.I. SHAPIRO, Mass. Inst. of Technology, School of Science, *Cambridge, Massachusetts* 02139 (NAS 1-9702)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0006, THE INTERACTION OF SOLAR RADIATION WITH PLANETARY ATMOSPHERES
J.A. SAMSON, Univ. of Nebraska, School of Arts, *Lincoln, Nebraska* 68508

This grant funds research into ionization processes at wavelengths in the range 100 A to 1400 A. These results are important to the formation of the ionized components of planetary atmospheres. Absolute cross sections which are applicable to specific processes will be measured.

SUPPORTED BY U.S. Natl. Science Foundation

10.0007, LARGE HIGH RESOLUTION INTEGRATING TV SENSOR FOR ASTRONOMICAL APPLICATIONS
J. LOWRANCE, Princeton University, Graduate School, *Princeton, New Jersey* 08540 (NAS 5-20833)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0008, MAGNETOSPHERIC RESEARCH
D.T. FARLEY, Cornell University, School of Engineering, *Ithaca, New York* 14850

The work under this grant will include (1) the development of new models of the Jovian magnetosphere using Pioneer data and calculations of the cold plasma generated by photoelectron escape from the ionosphere; (2) development of the theory of toroidal gas rings associated with satellites of Jupiter and Saturn; (3) an investigation of radio source occultations by the ionospheres and/or magnetospheres of the outer planets; (4) a study of the propagation of very low frequency (MHz) radio waves between Jupiter and the Earth; and (5) development of new theoretical models for the propagation of energetic electrons from Jupiter to the Earth.

SUPPORTED BY U.S. Natl. Science Foundation

10.0009, CALCULATION OF COLLISION CROSS SECTIONS OF ASTROPHYSICAL INTEREST
R.N. ZARE, Columbia University, School of Arts, *New York, New York* 10027 (NSG 7105)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

10.0010, HIGH ENERGY GAMMA RADIATION AT ONE MILLIBAR
G.M. FRYE, Case Western Reserve Univ., Graduate School, *Cleveland, Ohio* 44106

The data from a cooperative flight with Professor V. Hopper, University of Melbourne will be thoroughly analyzed. The flight took place in the fall of 1974 from Australia. The region of the Southern Sky observed included the Vela Pulsar and the center of the Large Magellanic Cloud. The November 1972 flights detected pulsed gamma rays from the Vela Pulsar. A new large area Multiple Wire Proportional Counter (MWPC) will be completed and tested. Four flights from Palestine, Texas are planned for 1975. The region of the sky observed will be from the equator to plus 60 degrees. A cooperative observing program with the scientists using the European satellite COS-B will provide simultaneous observations of several areas of the sky. The galactic anticenter, Crab nebula, the Cygnus X-1, BL Lacertae, and other regions will be observed.

SUPPORTED BY U.S. Natl. Science Foundation

10.0011, ANALYSIS OF DATA FROM THE ION MASS SPECTROMETER ON THE EXPLORER XXXI SATELLITE
J.H. HOFFMAN, Univ. of Texas, Graduate School, *Dallas, Texas* 75230 (NSR 44-004-089)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

GENERAL

11.0001, LABORATORY SCALE FIRE TEST FACILITIES
UNKNOWN, Calif. State Univ. & Colleges, Graduate School, *San Jose, California* 95114 (NCA 2-75411)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

11.0002, A STUDY - OUTLOOK FOR SPACE
M. MARNEY, George Washington University, Graduate School, *Washington, District of Columbia* 20006 (NAS 5-20843)

SUPPORTED BY U.S. Natl. Aero. & Space Adm.

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Scientific and Technical Aerospace Reports

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01 AERONAUTICS (GENERAL)

N75-22267# Army Aviation Systems Command, St. Louis, Mo.
MAJOR ITEM SPECIAL STUDY (MISS): OH-58A MAIN ROTOR BLADE Interim Report, Jan. 1964 - Jul. 1973
Oct. 1974 24 p refs
(AD-A000797/1; USAAVSCOM-TR-74-44) Avail: NTIS HC $3.25 CSCL 01/3

The report is designed to illustrate how cost savings can result by analyzing reported removal data from fielded Army aircraft. Certain equipment, because of finite life, high cost, or need for intensive management, is classified as reportable for control purposes on the DA Form 2410. The MISS report investigates these components for possible cost savings based upon total elimination of selected failure modes. GRA

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N75-22268 North Carolina State Univ., Raleigh.
AN EXPERIMENTAL STUDY OF THE REDEVELOPMENT OF A DISTORTED PIPE FLOW Ph.D. Thesis
Jay Dee Hunt 1974 90 p
Avail: Univ. Microfilms Order No. 75-5362

The turbulent structure of a distorted air flow in a pipe was investigated. Fully developed flow corresponding to a Reynolds number 210,000 is distorted by a 180 degree bend. After the air goes through the bend, redevelopment of the distorted flow back to a fully developed condition occurs in a straight outlet tube which is located downstream from the exit of the bend. Constant-temperature hot-wire anemometers are used to obtain distributions of mean velocity, longitudinal intensity, radial intensity, transverse intensity, and turbulent shear stress across the vertical diameter at several axial locations in the region of redevelopment. Distributions of turbulence intensities across vertical radii in the redevelopment region are compared to fully developed turbulence intensities. From this comparison, the manner and degree of decay of the turbulence intensities are observed. Decay to fully established profiles is seen to occur rapidly. Dissert. Abstr.

N75-22269 Rutgers Univ., University Park, N.J.
EXPERIMENTS WITH A ROTATING SOURCE-SINK ANNULUS Ph.D. Thesis
Carmen Peter Cerasoli 1974 186 p
Avail: Univ. Microfilms Order No. 75-8379

Experiments using a rotating source-sink annulus are described. The steady, interior circulation is measured, with particular attention given to the vertical sidewall boundary layer. Experimental sidewall thicknesses are compared to the theoretical values predicted by Hide and others. The effects produced by hot wire probe supports (rods typically 2 to 3 mm in diameter) are found to be substantial. The wake produced by the rod is unstable and gives rise to azimuthally traveling waves. These wake instabilities exhibit the observed properties of wave motions. A simplified model of the wake instability in cylindrical geometry is presented along with experimental data and good qualitative agreement exists between theory and experiment. Calculations on the structure of inertial waves in the presence of a mean azimuthal velocity field are also presented. Dissert. Abstr.

N75-22270 Polish Academy of Sciences, Warsaw.
ALGORITHMS FOR COMPUTATION OF AERODYNAMIC COEFFICIENTS OF A BIPLANE [ALGORYTMY OBLICZANIA WSPOLCZYNNIKOW AERODYNAMICZNYCH DWUPLATA]
W. J. Prosnak and M. E. Klonowska 1974 161 p refs In POLISH
Avail: Issuing Activity

Theoretical bases are presented for the algorithms for a biplane found in a flat, stationary stream of an ideal liquid, homogeneous in infinity. The biplane was determined by a conformally representative function. The algorithms are written in ALGOL 1204 in the form of two corresponding programs. One program computes the pressure distribution on each biplane profile for a given angle of attack, and photocopies the image of the biplane profile on a kinescopic screen. The second program computes the coefficients of forces and aerodynamic moments of the whole biplane and of particular profiles. Transl. by M.J.S.

N75-22271 Polish Academy of Sciences, Warsaw.
INFLUENCE OF TWO-DIMENSIONALITY ON THE FLOW OF WATER VAPOR FROM CONDENSATION INTO A LAVAL NOZZLE [WPLYW DWUWYMIAROWOSCI NA PRZEPLYW PARY WODNEJ Z KONDENSACJA W DYSZY DE LAVALA]
Magdalena Bratos 1974 63 p refs In POLISH
Avail: Issuing Activity

Condensation processes in a two dimensional Laval nozzle are analyzed, and the results are compared with results of a one dimensional approximation for a determinate model of physical condensation. A system of partial differential equations with one and two dimensional flow was constructed, and a numerical analysis was completed. Transl. by M.J.S.

N75-22272 North Carolina State Univ., Raleigh.
APPLICATION OF EXTERNAL AERODYNAMIC DIFFUSION TO SHROUDED PROPELLER NOISE REDUCTION Ph.D. Thesis
Richard Edward Longhouse 1974 138 p
Avail: Univ. Microfilms Order No. 75-7678

The noise reduction potential of external aerodynamic diffusion (EAD) when applied to V/STOL shrouded propellers during hover operation was investigated. The EAD is characterized by a short, highly divergent diffuser with boundary layer control. The rotor-stator interaction noise of a subsonic rotor was considered. A rotor with upstream stator blades was constructed. Diffuser boundary layer control was incorporated and an anechoic

chamber was constructed. Model thrust and rotation speed were monitored. The results indicate that EAD is effective in reducing rotor-stator potential interaction noise. Overall noise reduction appears to depend on the relative magnitude of the two types of noise mechanisms. Dissert. Abstr.

N75-22273 + Imperial Coll. of Science and Technology, London (England). Dept. of Aeronautics.
TURBULENT FLOW IN DUCTS AND PIPES: A LITERATURE SURVEY
R. B. Dean Dec. 1974 33 p refs
(IC-Aero-74-12) Avail: NTIS HC $3.75

A total of 41 references is cited which contain experimental data on turbulent (and laminar) flow in rectangular ducts of aspect ratio greater than or equal to 7. A further 22 references are quoted which discuss the analytical and theoretical aspects of two-dimensional duct flow. Some include a prediction method. A selection of references on low aspect ratio rectangular ducts, converging and divergent ducts, and circular pipe flow is given. ESRO

N75-22274*# Martin Marietta Labs., Baltimore, Md.
INVISCID FLOW ABOUT BLUNTED CONES OF LARGE OPENING ANGLE AT ANGLE OF ATTACK Final Report
Stephen H. Maslen Mar. 1975 15 p refs
(Contract NAS1-12872)
(NASA-CR-132652; MML-TR-75-10C) Avail: NTIS HC $3.25 CSCL 20D

Application of a general method for calculation of inviscid hypersonic flow fields is discussed. General considerations are analyzed along with the sonic corner and the stagnation region. It is concluded that the complications caused by the requirement for sonic flow at the rear corner and particularly by the uncertain position of the stagnation streamline lead to sufficient difficulties with convergence of iterations that a practical procedure is not likely to be found. Author

N75-22275*# National Aeronautics and Space Administration. Flight Research Center, Edwards, Calif.
COMPARISONS OF WING PRESSURE DISTRIBUTION FROM FLIGHT TESTS OF FLUSH AND EXTERNAL ORIFICES FOR MACH NUMBERS FROM 0.50 TO 0.97
Lawrence C. Montoya and David P. Lux Apr. 1975 26 p refs
(NASA-TM-X-56032) Avail: NTIS HC $3.75 CSCL 01A

Wing pressure distributions obtained in flight with flush orifice and external tubing orifice installations for Mach numbers from 0.50 to 0.97 are compared. The procedure used to install the external tubing orifice is discussed. The results indicate that external tubing orifice installations can give useful results. Author

N75-22276*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
AN APPROXIMATE CLOSED-FORM SOLUTION FOR LEAD LAG DAMPING OF ROTOR BLADES IN HOVER
David A. Peters Apr. 1975 27 p refs Prepared in cooperation with Army Air Mobility R and D Lab., Moffett Field, Calif.
(NASA-TM-X-62425; A-6025) Avail: NTIS HC $3.75 CSCL 01A

Simple stability methods are used to derive an approximate, closed-form expression for the lead-lag damping of rotor blades in hover. Destabilizing terms are shown to be a result of two dynamic mechanisms. First, the destabilizing aerodynamic forces that can occur when blade lift is higher than a critical value are maximized when the blade motion is in a straight line equidistant from the blade chord and the average direction of the air flow velocity. This condition occurs when the Coriolis terms vanish and when the elastic coupling terms align the blade motion with this least stable direction. Second, the nonconservative stiffness terms that result from pitch-flap or pitch-lag coupling can add or subtract energy from the system depending upon whether the motion of the blade tip is clockwise or counterclockwise. Author

N75-22277*# National Aeronautics and Space Administration. Flight Research Center, Edwards, Calif.
EVALUATION OF A HEMISPHERICAL HEAD FLOW DIRECTION SENSOR FOR INLET DUCT MEASUREMENTS
Donald L. Bennett Washington May 1975 24 p refs
(NASA-TM-X-3232; H-862) Avail: NTIS HC $3.25 CSCL 20D

A hemispherical head flow direction sensor was tested in a wind tunnel to evaluate its effectiveness for measuring dynamic duct flow direction angles of plus and minus 27 degrees. The tests were conducted at Reynolds numbers of 3.8 million per meter (1.0 million per foot) and 4.92 million per meter (1.5 million per foot) and at Mach numbers from 0.30 to 0.70. The design criteria for the probe are discussed and the wind tunnel results are presented. Three techniques for deriving the flow angles are described. Author

N75-22278*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECT OF ENTRY-LIP DESIGN ON AERODYNAMICS AND ACOUSTICS OF HIGH THROAT MACH NUMBER INLETS FOR THE QUIET, CLEAN, SHORT-HAUL EXPERIMENTAL ENGINE
Brent A. Miller, Benjamin J. Dastoli, and Howard L. Wesoky Washington May 1975 45 p refs
(NASA-TM-X-3222; E-8160) Avail: NTIS HC $3.75 CSCL 01A

Results of scale model tests of high-throat-Mach-number inlets designed to suppress inlet-emitted engine machinery noise produced in a V/STOL wind tunnel are presented. A vacuum system was used to induce inlet airflow with a siren as a noise source. Inlet mass flow was 11.68 kilograms (25.75 lb. min) per second at a throat Mach number of 0.79. The effect of entry-lip design (contraction ratio and diameter ratio) on inlet total-pressure recovery, steady-state pressure distortion, performance at high incidence angles, and noise suppression was determined. With proper entry-lip design, total-pressure recovery in excess of 0.988 could be obtained statically at an average throat Mach number of 0.79. Total-pressure distortion was 5 percent. The reduction in the siren tone sound pressure level transmitted through the inlet was 10 to 14 db relative to that measured at throat Mach 0.6. Author

N75-22279*# Boeing Commercial Airplane Co., Seattle, Wash.
AERODYNAMIC DESIGN AND ANALYSIS SYSTEM FOR SUPERSONIC AIRCRAFT. PART 2: USER'S MANUAL Final Report
W. D. Middleton, J. L. Lundry, and R. G. Coleman Washington NASA Mar. 1975 198 p refs
(Contract NAS1-12052)
(NASA-CR-2521; D6-41759-Pt-2) Avail: NTIS HC $7.00 CSCL 01C

An integrated system of computer programs for supersonic configurations is described. An explanation of system usage, the input definitions, and example output are included. For Part 1, see N75-18185; for Part 3, see N75-18186. Author

N75-22280# Advisory Group for Aerospace Research and Development, Paris (France).
AIRCRAFT STALLING AND BUFFETING
Feb. 1975 169 p refs In ENGLISH; partly in FRENCH
(AGARD-LS-74) Avail: NTIS HC $6.25

Lectures on the subject of aircraft stalling and buffeting are presented. The scope of the presentations involves recent developments in the understanding of the fluid dynamics of aerodynamic stalling and buffeting, the dynamic response of the aircraft, and techniques for buffet prediction, with consideration of the implications for aircraft design. For individual titles, see N75-22281 through N75-22287.

N75-22281 Royal Aircraft Establishment, Bedford (England).
AIRCRAFT STALLING AND BUFFETING: INTRODUCTION AND OVERVIEW
C. R. Taylor *In* AGARD Aircraft Stalling and Buffeting Feb. 1975 18 p refs (For availability see N75-22280 14-02)

The phenomena of aircraft stalling and buffeting are analyzed with respect to the influence exerted by various aerodynamic configurations. Variations of the lift coefficient of a wing with changes in angle of incidence and Mach number are examined to show the effect on the stalling characteristics. Aerodynamic designs which provide a uniform pressure distribution as a method

for delaying the onset of aerodynamic stall are described. Block diagrams are developed to show the relationships of aerodynamic forces and aerodynamic effects for structural buffeting and rigid-body dynamics. The limitations imposed on aircraft maneuverability by the onset of aerodynamic stall are explained. Author

N75-22282 Douglas Aircraft Co., Inc., Long Beach, Calif.
REMARKS ON FLUID DYNAMICS OF THE STALL
A. M. O. Smith *In* AGARD Aircraft Stalling and Buffeting Feb. 1975 33 p refs (For availability see N75-22280 14-02)

An analysis of aerodynamic stalling based on fluid mechanics phenomena is presented. Emphasis is placed on the flow separation which occurs during a stall and flow photographs of such events are provided. Limits to pressure rise for both laminar and turbulent flows are given, as well as their general theory. The effects of Reynolds number, Mach number, and airfoil shape on flow separation are examined. Diagrams of the conditions existing in full aircraft stall and buffeting process are developed. The problem of calculating flows with separation is discussed. Author

N75-22283 Boeing Co., Seattle, Wash.
PREDICTION AND ANALYSIS OF THE LOW SPEED STALL CHARACTERISTICS OF THE BOEING 747
William McIntosh and John K. Wimpress *In* AGARD Aircraft Stalling and Buffeting Feb. 1975 21 p (For availability see N75-22280 14-02)

Wind tunnel tests for estimating the stall speed of the Boeing 747 aircraft were conducted. The test results were adjusted to full scale flight values using correlation factors developed from other transport aircraft designs. Flight results showed a reasonable degree of success in predicting stall speeds. A further analysis was made to show the effects of aeroelastic and airplane dynamics in accurately predicting aerodynamic stall. Author

N75-22284 Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
FLOW SEPARATION AND AERODYNAMIC EXCITATION AT TRANSONIC SPEEDS
B. Monnerie *In* AGARD Aircraft Stalling and Buffeting Feb. 1975 14 p refs In FRENCH; ENGLISH summary (For availability see N75-22280 14-02)

The effects that the birth and growth of separated flow areas on an aerospace vehicle surface have on aerodynamic stalling and buffeting are discussed. The separated flow areas are defined as those points of turbulent flow which produce high level pressure fluctuations and excite the vehicle structure. The influence of strong positive pressure gradients in the transonic regime is analyzed. The computation of buffeting intensity is analyzed with respect to the characteristics of the unsteady pressure field. Author

N75-22285 Royal Aircraft Establishment, Bedford (England).
AIRCRAFT DYNAMIC RESPONSE ASSOCIATED WITH FLUCTUATING FLOW FIELDS
J. G. Jones *In* AGARD Aircraft Stalling and Buffeting Feb. 1975 15 p refs (For availability see N75-22280 14-02)

The interactions of fluctuating flow fields and the dynamic response of aircraft structures which results in buffeting are discussed. A basic feature of the dynamic analysis of buffeting is the closed-loop interaction between the fluctuating fluid motion and the motion of the wing surface. The problem of formulating an appropriate theoretical model for structural buffeting is discussed, together with the analogous situation involving response in rigid-body modes, including the oscillatory motion known as wing-rocking. Author

N75-22286 British Aircraft Corp., Warton (England). Aerodynamics Dept.
PRE-STALL BEHAVIOR OF COMBAT AIRCRAFT
D. E. Shaw *In* AGARD Aircraft Stalling and Buffeting Feb. 1975 18 p refs (For availability see N75-22280 14-02)

High incidence, pre-stall behavior of combat aircraft is discussed in terms of fluid flow characteristics and the corresponding flight dynamic phenomena. Emphasis is placed on the aerodynamic phenomena which are defined as wing-rock. The phenomena are associated with a collapse of the dutch roll characteristics to a divergent rolling oscillation and with the rigid airframe response in the dutch roll made to the low frequency content of wing buffet. Author

N75-22287 Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).
CRITICAL REVIEW OF METHODS TO PREDICT THE BUFFET PENETRATION CAPABILITY OF AIRCRAFT
Helmut John *In* AGARD Aircraft Stalling and Buffeting Feb. 1975 29 p refs (For availability see N75-22280 14-02)

A general survey of methods for predicting the buffet penetration capability of various aircraft is presented. The influence of aerodynamic buffeting on the performance and maneuverability of aircraft is discussed. The prediction of buffeting intensity on the basis of mean aerodynamic loads is examined. Mathematical models of the buffet response to determine loads and peak accelerations are developed. Wind tunnel tests for determining stall characteristics using a forced vibration model in one case and a nonlinear flutter model in the second case are described. Author

N75-22288# Institut Franco-Allemand de Recherches, St. Louis (France).
DIVERGENT NOZZLE CALCULATION FOR SUPERSONIC FLOW WITH ADDED THERMAL ENERGY [CALCUL DE TUYERES DIVERGENTES POUR UN ECOULEMENT SUPERSONIQUE AVEC APPORT D'ENERGIE THERMIQUE]
B. Gautier 11 Jun. 1974 37 p In FRENCH
(Contract DRME-74/397)
(ISL-23/74) Avail: NTIS HC $3.75

The method used for calculating the supersonic flow in a divergent nozzle of given shape when a given quantity of thermal energy is injected in a known way is reviewed. This calculation method is used to determine the nozzle shape. A parametric study of some variables, among which the choice of the Mach number distribution and the nature of the considered gas, leads to optimization of the nozzle shape with regard to the following constraints: absorption capability up to 500 joules/sec in a supersonic flow and ejection of the gas at nozzle output at atmospheric pressure. ESRO

N75-22289# Saarland Univ., Saarbrucken (West Germany). Inst. fuer Mathematik.
INVESTIGATION OF SOUND EMISSION FROM A JET ENGINE INLET IN AN AXIAL FLOW Ph.D. Thesis
Norbert Friedrich Porz, West Ger. DFVLR 3 Feb. 1975 232 p refs In GERMAN; ENGLISH summary
(DLR-FB-75-24) Avail: NTIS HC $7.50; DFVLR, Porz, West Ger. 77,90 DM

An idealized model is considered of a jet engine inlet situated in an inviscid compressible gaseous medium flowing through and past it at a speed less than that of sound. A spinning mode is generated in the engine far down-stream from the opening. The induced velocity and pressure fields are calculated using the linearized theory of sound waves of small amplitudes. In particular, reflection coefficients and the far field are determined, and the case of small duct widths is discussed. Author (ESRO)

N75-22290# European Space Research Organization, Paris (France).
THE APPLICATION OF TEMPERATURE-SENSITIVE CRYSTALS TO AERODYNAMIC INVESTIGATIONS
D. Vennemann et al Jun. 1974 28 p refs Transl. into ENGLISH of "Ueber die Verwendung temperaturempfindlicher Kristalle bei aerodynamischen Untersuch." DFVLR, Porz, West Ger. Report DLR-FB-73-121, Aug. 1973 Original German report available from DFVLR, Porz, West Ger. 10.50 DM
(ESRO-TT-77; DLR-FB-73-121) Avail: NTIS HC $3.75

The physical properties of liquid crystals are discussed indicating that they can be used as temperature indicators in heat transfer experiments. The principal methods employed for heat transfer measurements, the thin skin and the thick wall technique, are briefly examined along with the apparatus used for heat transfer measurements with liquid crystals. The method is calibrated with a reference sphere and applied to a sharp cone in a Mach 8 flow. Results agree with those from a transient thin skin technique. Author (ESRO)

N75-22291# European Space Research Organization, Paris (France).
PROBLEMS RELATING TO WIND TUNNEL SIMULATION OF RELAXING FLOWS
Klaus Robert Feb. 1975 24 p refs Transl. into ENGLISH of "Zur Problematik der Simulation relaxierender Stroemungen im Windkanal" DFVLR, Porz, West Ger. Report DLR-FB-74-31, 17 Apr. 1974 Original German report available from DFVLR, Porz, West Ger. 12.60 DM
(ESRO-TT-135; DLR-FB-74-31) Avail: NTIS HC $3.25

Feasibility of and main problems connected with direct and indirect wind tunnel simulation of relaxing flows are considered in view of wind tunnel-free flight data transfer. Complete direct simulation of free flight conditions in a hypersonic low density tunnel is not practically possible. Indirect simulation requires a computation method for three dimensional, viscous, and relaxing flows to be used iteratively. For a simple model case, an indirect simulation procedure by means of a Rayleigh line diagram is given. Author (ESRO)

N75-22292# Delta Research Corp., Arlington, Va.
DETERMINATION OF COEFFICIENT OF DRAG FOR A 530000 CUBIC FOOT NATURAL SHAPE BALLOON
C. Dudley Fitz and R. R. Hibbard 28 Jun. 1974 26 p refs
(Contract F08606-74-C-0021)
(AD-A007218) Avail: NTIS CSCL 01/3

Tow tests were conducted on a 530,000 cubic foot natural shape balloon for the purpose of estimating the aerodynamic drag coefficient of this balloon over a wider range of relative wind speeds than the 8.5 to 12.0 knot tests conducted in previous experiments. These tests are part of a series of investigations conducted to evaluate the feasibility of utilizing a natural shape balloon system in ship-to-shore cargo transport. GRA

N75-22293# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THREE DIMENSIONAL BOUNDARY LAYER IN A VICINITY OF THE CRITICAL LINE OF THE SLIDING WING WITH NONUNIFORM SUCTION
V. A. Barinov 13 Feb. 1975 26 p refs Transl. into ENGLISH from Uch. Zap., Tsent. Aerogidrodinamicheskii Inst. (USSR), v. 3, no. 1, 1972 p 23-29
(AD-A007194; FTD-MT-24-0423-75) Avail: NTIS CSCL 01/3

A numerical method for calculating the equations of the incompressible boundary layer is presented, which is a generalization of the method for determining integral relationships of the three dimensional boundary layer. Results are given of the performance calculation of the boundary layer for different distribution laws of suction along the leading edge of a wing. Author

N75-22294# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE STABILITY OF MOTION OF PARACHUTE IN THE STEADY-STATE REDUCTION MODE
A. A. Shilov 24 Jan. 1975 27 p refs Transl. into ENGLISH from Uch. Zap., Tsent. Aerogidrodinamicheskii Inst. (USSR), v. 2, no. 4, 1971 p 76-83
(AD-A007183; FTD-MT-24-465-75) Avail: NTIS CSCL 01/3

The stability conditions of the plane oscillation of a parachute are examined under the conditions of the reduction mode, taking into account the virtual inertia effect of air. GRA

N75-22295# Defense Documentation Center, Alexandria, Va.
USE OF HELICOPTERS FOR AIR DELIVERY AND EMERGENCY Report Bibliography, Sep. 1954 - May 1974
Mar. 1975 66 p refs
(AD-A006750; DDC-TAS-75-2) Avail: NTIS CSCL 01/2

This bibliography contains citations of 39 unclassified reports dealing with use of helicopters for air delivery and emergency, aerial delivery, air drop operations, search and rescue, and emergency medical care. Corporate Author-Monitoring Agency, Subject, Title, Personal Author, Contract and Report Number Indexes are included. GRA

N75-22296# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
EVALUATION OF THE EFFECT OF TRANSIENCY IN THE FLUTTER ANALYSIS OF AIRCRAFT WITH THE WING OF THE SMALL ELONGATION IN INCOMPRESSIBLE FLOW
E. N. Nabyullin 27 Jan. 1975 18 p refs Transl. into ENGLISH from Uch. Zap. Tsentr. Aerogidrodinamicheskii Inst. (USSR), v. 3, no. 4, 1972 p 145-148
(AD-A007204; FTD-MT-24-0561-75) Avail: NTIS CSCL 01/1

Aerodynamic influences which define the aerodynamic rigidity of aircraft are considered as the sum of effects of aerodynamic forces. The Strouhal number is equal to zero, and the forces proportional to the Strouhal number are added to inertial forces. Other topics discussed include aerodynamic damping, delta wings, incompressible flow, and pressure distribution. M.J.S.

N75-22297# Technology, Inc., Dayton, Ohio.
STRUCTURAL LOADS SURVEY DURING COLD-WEATHER OPERATIONS Final Report, Sep. 1973 - Sep. 1974
Terry Z. Cox and Thomas A. Torres Feb. 1975 185 p refs
(Contract DAAJ02-74-C-0006; DA Proj. 1F1-62208-AA-43)
(AD-A007091; USAAMRDL-TR-75-3) Avail: NTIS CSCL 01/3

To determine the effects of cold weather on the loads of dynamic components in the main and tail rotor systems of the UH-1H helicopter was the prime objective of the reported study. Accordingly, 18 hours of in-flight oscillograph data were recorded on these components while the helicopter flew at prescribed temperature-density altitude conditions in the arctic environment of Allen Army Airfield, Fort Greely, Alaska, during January and February of 1974. Equipped with strain gages, the instrumented components were the main and tail rotor blades, drag brace, scissors link, collective and cyclic boost tubes, and tail rotor shaft. GRA

N75-22298# Ohio State Univ. Research Foundation, Columbus.
INVESTIGATION OF GEAR DYNAMICS SIGNAL ANALYSIS Final Report, 15 Jul. 1973 - 15 Sep. 1974
Michael J. Drosjack, Donald R. Houser, and Arthur C. Tinney Jan. 1975 189 p refs
(Contract DAAJ02-73-C-0103; DA Proj. 1F2-62290-AH-76)
(AD-A006584; USAAMRDL-TR-75-1) Avail: NTIS CSCL 01/3

This study was performed to investigate the dynamic effects encountered at the gear mesh as the result of gear tooth surface faults. For this purpose, a torsional dynamic simulation of a geared system was developed which included provisions to account for the effect of pitting on a gear tooth. Tests were performed with gears which were in good condition and with gears containing manufactured faults. Results of the experiments and simulation were compared, and substantial correlation was found between the two. Thus, the capability of the simulation to model a fault on a tooth was substantiated. GRA

N75-22299# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
EXPERIMENTAL STUDY OF THE STARTING OF THE SIMPLEST AIR INTAKES WITH SMALL REYNOLDS NUMBERS
I. S. Borovkov, I. D. Vershinin, and Yu. G. Rakogon 4 Feb. 1975 26 p refs Transl. into ENGLISH from Uch. Zap. Tsagi (USSR), v. 4, no. 1, 1973 p 97-102
(AD-A007197; FTD-MT-24-0503-75) Avail: NTIS CSCL 01/3

The Navier-Stokes was used to calculate the start-up conditions of cylindrical air intakes during viscous laminar flow. Wind tunnel experiments were conducted along with experiments with models of internal compression air intakes. Other topics discussed include boundary layer equations, static and total pressure, supersonic flow, Reynolds number, and stagnation pressure. M.J.S.

N75-22300# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE DYNAMIC MODEL OF PARACHUTE AND DETERMINATION OF ITS CHARACTERISTICS
A. G. Byushgens and A. A. Shilov 29 Jan. 1975 31 p refs Transl. into ENGLISH from Uch. Zab. Tsentr. Aerogidrodinamicheskii Inst. (USSR), v. 3, no. 4, 1972 p 49-58
(AD-A007200; FTD-MT-24-0551-75) Avail: NTIS CSCL 01/3

Plane motion equations of a fixed-geometry parachute were examined taking into account the virtual inertia effect of the air.

The frequency response analysis was proposed for determining the aerodynamic and dynamic parameters of the system necessary for linear analysis of stability. It was found that the aerodynamic characteristics of a parachute depend on the angle of attack and the dimensionless angular rate of rotation. M.J.S.

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation*.

N75-22301*# Douglas Aircraft Co., Inc., Santa Monica, Calif.
ANALYSIS OF OPERATIONAL REQUIREMENTS FOR MEDIUM DENSITY AIR TRANSPORTATION, VOLUME 2 Final Report
Mar. 1975 388 p refs
(Contract NAS2-8135)
(NASA-CR-137604; MDC-J4484-Vol-2) Avail: NTIS HC $10.25 CSCL 01C

The medium density air travel market is examined and defined in terms of numbers of people transported per route per day and frequency of service. The operational characteristics for aircraft to serve this market are determined and a basepoint aircraft is designed from which tradeoff studies and parametric variations can be conducted. The impact of the operational characteristics on the air travel system is evaluated along with the economic viability of the study aircraft. Research and technology programs for future study consideration are identified. J.M.S.

N75-22302*# Douglas Aircraft Co., Inc., Santa Monica, Calif.
ANALYSIS OF OPERATIONAL REQUIREMENTS FOR MEDIUM DENSITY AIR TRANSPORTATION. VOLUME 3: APPENDIX
Mar. 1975 277 p
(Contract NAS2-8135)
(NASA-CR-137605; MDC-J4484-Vol-3) Avail: NTIS HC $8.75 CSCL 01C

For abstract, see N75-22301.

N75-22303# Boeing Vertol Co., Philadelphia, Pa.
CRASHWORTHY TROOP SEAT INVESTIGATION Final Report
Mason J. Reilly Dec. 1974 336 p refs
(Contract DAAJ02-72-C-0077; DA Proj. 1F1-62205-A-529)
(AD-A007090; D210-10778-4; USAAMRDL-TR-74-93) Avail: NTIS CSCL 01/3

The purpose of this investigation was to perform a research program for the development, analytical verification, mockup evaluation, and comparison of designs for practical crashworthy forward-, aft-, and side-facing troop seating systems for U.S. Army helicopters. Tasks performed during the program included a literature survey, military organization survey, and questionnaire distribution to obtain data on existing seats, restraint systems, accommodation and human factors requirements, mathematical simulation of crash force attenuation, and energy attenuator development. These data were used in developing 19 crashworthy troop seat concepts and several restraint systems applicable to troop use. GRA

N75-22304# Air Force Logistics Command, Wright-Patterson AFB, Ohio.
AN OPERATIONAL FIRE HAZARDS ANALYSIS OF THE C-5
Feb. 1975 151 p
(AD-A007072) Avail: NTIS CSCL 01/3

The objective established for the study was to identify potential fire hazards in the C-5. A potential fire hazard may be identified as any area containing both an ignition source and a combustible material. The C-5, as any aircraft, contains the combustibles (such as hydraulic fluid and JP-4) and ignition sources (such as electrical/electronic components and wiring; hot surfaces; hydraulic motors, actuators, and highspeed rotating components) necessary for fire initiation, i.e., potential fire hazards. GRA

N75-22305# Technology, Inc., Dayton, Ohio.
A FEASIBILITY STUDY FOR MONITORING SYSTEMS OF FATIGUE DAMAGE TO HELICOPTER COMPONENTS Final Report, Mar. 1973 - Aug. 1974
R. B. Johnson, G. L. Martin, and M. S. Moran Jan. 1975 194 p refs
(Contract DAAJ02-73-C-0053)
(AD-A006641; USAAMRDL-TR-74-92) Avail: NTIS CSCL 01/3

The report describes efforts to monitor and record the in-flight operations of UH-1H and CH-47C helicopters for the subsequent assessment of the fatigue damage to their structures, four types of monitoring were investigated: (1) flight condition monitoring, (2) component-load monitoring, (3) mission-type monitoring, and (4) direct monitoring. After the recording systems and corresponding data processing systems were identified for each monitoring type, each type was tested for its technical acceptability and cost-effectiveness. Study results indicated that the flight condition monitoring is best for the UH-1H and also for the CH-47C provided that the monitoring of gross weight for the latter model becomes technically acceptable. GRA

N75-22306# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.
THE POTENTIAL OF AN 8 X 8 X 5 FEET INTERMODAL CONTAINER AS A UNITIZATION MEDIUM FOR ROUTINE MILITARY AIR CARGO M.S. Thesis
Michael M. Rice and Dennis E. Welch Jan. 1975 236 p refs
(AD-A006675; SLSR-23-75A) Avail: NTIS CSCL 15/5

This study addressed one of the factors which affect the use of intermodal containers for air cargo shipments; the relationship between the size and quantity of the air cargo to be shipped and the size of the intermodal container. The cargo data used in the study were extracted from records of air shipments from Dover AFB, Delaware to Rhein Main and Ramstein AFBs for the third quarter of FY 1974. The container used in the study was a proposed 8 ft. x 8 ft. x 5 ft. intermodal QUADCON container. The overseas transportation network used in the study consisted of one CONUS APOE, one overseas APOD, and nine cargo break-bulk point destinations. Several computer programs and a GE 600 series computer were used to manipulate the cargo data. GRA

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications*.

N75-22307 Kansas Univ., Lawrence.
AN INVESTIGATION OF AIR TRAFFIC CONTROL PROCEDURES AND PILOT TECHNIQUES IN A HIGH DENSITY TERMINAL AREA Ph.D. Thesis
Charles Edward Knox 1974 389 p
Avail: Univ. Microfilms Order No. 75-6149

An investigation was conducted to determine if increases in runway capacity could be achieved through the modification of various air traffic control procedures and pilot techniques. Modified procedures and techniques were to be specified such that equipment not already necessary for IFR and/or VFR flight in a high density, semi-positive controlled airspace would not be required. A summary of pertinent pilot and air traffic controller constraints and airspace structure around the high density terminal area and a review of wake vortex characteristics and avoidance procedures was included in this investigation. Kinematic equations of motion and aircraft performance equations were developed for take-off, landing, and in-flight maneuvering computations. The landing only runway capacity investigation was conducted as a

parametric trade-off study, with runway capacity as the dependent variable. Parametric plots as a function of approach speed were drawn with operations per hour as the result. This procedure allowed quick and simple calculations to be performed that showed relative runway capacity changes due to parametric changes resulting from technique and procedural modifications.
Dissert. Abstr.

N75-22308# Institute for Telecommunication Sciences, Boulder, Colo.
MULTIPATH IN AIR TRAFFIC CONTROL FREQUENCY BANDS, VOLUME 2: CHAPTERS C3 - G4, GENERAL BIBLIOGRAPHY
William J. Hartman, ed. Jul. 1974 471 p refs
(Contract DOT-FA72WAI-239)
(AD-A006268; FAA-74-75-Vol-2) Avail: NTIS HC $11.50 CSCL 17/2

Theories and techniques dealing with multipath problems are presented with emphasis placed on air traffic control frequencies. The material presented is oriented toward frequencies above VHF, and toward line-of-sight paths. The following factors are included: causes of multipath, Doppler effects, methods for reducing the effects of multipath, and specific system considerations.
Author

N75-22309# Laboratoire de Recherches Balistiques et Aerodynamiques, Vernon (France). Service Systemes Inertiels et Electroniques.
PROGRAM DLABO: CALCULATION OF GYROSCOPIC DRIFTS dX, AND dY, AND dZ IN THE LABORATORY FOR THREE INERTIAL PLATFORMS IN NAVIGATION MODES [NOTICE DU PROGRAMME DLABO. CALCUL DES DERIVES GYROSCOPIQUES dX, dY ET dZ DE TROIS PLATES-FORMES INERTIELLES EN MODE NAVIGATION DANS UN LABORATOIRE]
M. Mouton 24 Oct. 1974 43 p In FRENCH
(LRBA-E-307-NT-67/SEY) Avail: NTIS HC $3.75

The DLABO computer program for gyroscopic drift calculation of one or more coupled navigation inertial platforms on nonmoving support is presented. The input data take into account the date, time, latitude and longitude errors, pilot platform head error, and head error of secondary platforms with respect to the pilot platform. Every 15 min. an automatic message facility gives the output data. The program is described and its implementation on UNIVAC computer detailed.
ESRO

N75-22310# European Space Research Organization, Paris (France).
STATISTICAL STUDIES ON THE ACCURACY OF CAROUSEL 4 INERTIAL NAVIGATION SYSTEMS AFTER FLIGHTS OVER THE NORTH ATLANTIC
Otto Weber Feb. 1975 82 p refs Transl. into ENGLISH of "Statistische Untersuch. ueber die Genauigkeit von Traegheitsnavigationsanlagen Carousel 4 nach Nordatlantikfluegen" DFVLR, Porz, West Ger. Report DLR-Mitt-74-10, 31 Jan. 1973 Original German report available from DFVLR, Porz, West Ger. 17 DM (ESRO-TT-136; DLR-Mitt-74-10) Avail: NTIS HC $4.75

The accuracy of a system of three Carousel 4 inertial navigation units after flights over the North Atlantic is discussed. The excessive errors and statistical parameters of a comprehensive data collection of Deutsche Lufthansa are determined and discussed. Excessive errors are often entire multiples of one degree. The approximation of the data by one or two-dimensional Gaussian distributions is possible only in some special cases. The displayed latitudes and longitudes which lie between the other two displayed data of the system have advantageous statistical features and an improved accuracy. The accuracy for a navigation time of one hour is estimated and compared with the accuracy of VOR/DME.
Author (ESRO)

N75-22311# Facility Checking Squadron (1866th) (AFCS), Richards-Gebaur AFB, Ohio.
ASR SPECIAL EVALUATION REPORT. RADAR BLIND SPEEDS WITH STAGGERED PRF, ELLINGTON AFB, TEXAS, 2-5 DECEMBER 1974 TRACALS Evaluation Report
Robert L. Cranston Dec. 1974 23 p
(AD-A007042; Rept-74/66S/28) Avail: NTIS CSCL 17/9

A special radar evaluation was performed at Ellington AFB, TX (2103 Comm Sq) between 2-5 Dec. 74. The purpose of the evaluation was to determine if the AN/MPN-13A (modified for staggered PRF) was subject to Airport Surveillance Radar MTI blind speeds. This report contains equipment check results, evaluation profile and an analysis of airborne flight data. The speed related target degradation detected with this radar is compared with evaluation data of similar radars modified for staggered PRF. This report supplements the Ellington Station Evaluation Report 73/66R-9 (015).
GRA

N75-22312# Facility Checking Squadron (1868th) (AFCS), APO New York 09332.
STATION EVALUATION REPORT, ZWEIBRUCKEN AIR BASE, GERMANY TRACALS Evaluation Report
Dick J. Burkard and Terry W. Selby 30 Dec. 1974 163 p
(AD-A006687; Rept-74/68-RTC-12) Avail: NTIS CSCL 17/7

The report presents data collected to define the capabilities and limitations of the Ground Controlled Approach (GCA) Facility, AN/MPN-13; Tactical Air Navigation (TACAN) System, AN/TRN-31; and Air Traffic Control communications at Zweibrucken Air Base, Germany. Included in the report are the descriptions of the airport surveillance radar (ASR) upper, lower, outer and inner fringes of usable coverage, coverage diagrams, and analysis of equipment performance data; Air Traffic Control Radar Beacon System (ATCRBS) coverage, tracking capabilities and analysis of its equipment performance data; a description of the lower outer and inner fringes of usable TACAN coverage, coverage diagrams and analysis of airborne and ground performance data. Also included are the precision approach radar (PAR) equipment performance data, analysis of its performance data and the analysis of the performance data of the Air Traffic Control ground-air-ground equipment used by the control tower and GCA.
GRA

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.
For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

N75-22313*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
FACTORS AFFECTING HANDLING QUALITIES OF A LIFT-FAN AIRCRAFT DURING STEEP TERMINAL AREA APPROACHES
Ronald M. Gerdes and Charles S. Hynes Apr. 1975 26 p refs
(NASA-TM-X-62424; A-6016) Avail: NTIS HC $3.75 CSCL 01C

The XV-5B lift-fan aircraft was used to explore the factors affecting handling qualities in the terminal area. A 10 deg ILS approach task was selected to explore these problems. Interception of the glide slope at 457.2 m, glide slope tracking, deceleration along the glide slope to a spot hover were considered. Variations in airplane deck angle, deceleration schedule, and powered-lift management were studied. The overall descent performance envelope was identified on the basis of fan stall, maximum comfortable descent rate, and controllability restrictions. The collective-lift stick provided precise glide slope tracking capability. The pilot preferred a deck-parallel attitude for which he used powered lift to control glide slope and pitch attitude to keep the angle of attack near zero. Workload was reduced when the deceleration schedule was delayed until the aircraft was well established on the glide slope, since thrust vector changes induced flight path disturbances.
Author

N75-22314*# McDonnell-Douglas Corp., Long Beach, Calif.
BORON/ALUMINUM SKINS FOR THE DC-10 AFT PYLON Final Report, 28 Feb. - 31 Oct. 1974
S. Y. Elliott May 1975 150 p refs
(Contract NAS1-13029)
(NASA-CR-132645) Avail: NTIS HC $5.75 CSCL 01C

Boron/aluminum pylon boat tail skins were designed and fabricated and installed on the DC-10 aircraft for a 5-year flight service demonstration test. Inspection and tests of the exposed

skins will establish the ability of the boron/aluminum composite to withstand long time flight service conditions, which include exposure to high temperatures, sonic fatigue, and flutter. The results of a preliminary testing program yield room temperature and elevated temperature data on the tension, compression, in-plane shear, interlaminar shear, bolt bearing, and tension fatigue properties of the boron/aluminum laminates. Present technology was used in the fabrication of the skins. Although maximum weight saving was not sought, weight of the constant thickness boron/aluminum skin is 26% less than the chemically milled titanium skin. Author

N75-22315# Calspan Corp., Buffalo, N.Y.
A TWO-PHASE INVESTIGATION OF LONGITUDINAL FLYING QUALITIES FOR FIGHTERS. PHASE 1: THE EFFECT OF EVALUATION TECHNIQUE AND FLIGHT PHASE ON FLYING QUALITIES ASSESSMENT. PHASE 2: AN EXAMPLE OF CRITERIA DEVELOPMENT, CONTROL SYSTEM DESIGN AND FLIGHT TEST EVALUATION OF FOUR CONTROL SYSTEMS USING Eta-Z, ALPHA, AND q FEEDBACK Final Report, 1 Feb. - 14 Dec. 1972
Edward M. Boothe, Robert T. N. Chen, and Charles R. Chalk Apr. 1974 291 p refs
(Contract F33615-73-C-3051)
(AD-782218; CALSPAN-AK-5280-F-2; AFFDL-TR-74-9) Avail: NTIS CSCL 01/2

A two-phase study was performed using the USAF Ni-33 A variable stability airplane. In Phase 1 of the study the effect of the evaluation technique used in the assessment of airplane flying qualities for the air combat flight phase was investigated. In-flight evaluations with and without a target airplane were performed for selected configurations from AFFDL-TR-70-74. The results from the evaluations with a target airplane were compared to results obtained with a target airplane and to the results in AFFDL-TR-70-74. In all cases, the evaluations performed without a target airplane were adequate to reveal potential flying qualities problems in the detailed pilot comments. There was, however, larger variability in the rating differences between the evaluations performed with and without a target. There were also significant rating differences between the evaluations performed with and without a target for about 15% of the configurations. (Modified author abstract) GRA

N75-22316# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE FATE OF THE WINGED METAL
F. Kvasov, A. Tumanov, and I. Fridlyander 3 Jan. 1975 16 p refs Transl. into ENGLISH from Literaturnaya Gazeta (USSR), no. 24, 12 Jun. 1974 p 11
(AD-A006843; FTD-HT-23-204-75) Avail: NTIS CSCL 01/3

The translation briefly touches on a few highlights in the history of aircraft construction since 1924 to the present. GRA

N75-22317# Kaman Aerospace Corp., Bloomfield, Conn.
ARMY AIRCRAFT SUBSYSTEM AND COMPONENT INSTALLATION DESIGN INVESTIGATION Final Report, Jun. 1973 - Aug. 1974
Thomas N. Cook, Frank E. Starses, and George W. Haire Feb. 1975 192 p
(Contract DAAJ02-73-C-0082; DA Proj. 1F2-62203-AH-86)
(AD-A007245; USAAMRDL-TR-75-7) Avail: NTIS CSCL 01/3

This report examines the design of major component installations in current-inventory helicopters and its effect on the man-hours required to replace these components. Recommendations are developed for improving the maintainability of future aircraft through state-of-the-art applications and new design concepts. GRA

N75-22488 Missouri Univ., Columbia. Coll. of Engineering.
FRETTING OF AIRCRAFT CONTROL SURFACES
David W. Hoeppner *In* AGARD Specialists Meeting of Fretting in Aircraft Systems Jan. 1975 9 p Sponsored in part by ONR (For availability see N75-22487 14-31)

N75-22489 Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).
FRETTING OF STRUCTURES FOR MODERN VG FIGHTERS
Volker Vontein and Peter E. Seibert *In* AGARD Specialists Meeting on Fretting in Aircraft Systems Jan. 1975 15 p refs (For availability see N75-22487 14-31)

N75-22490 Westland Helicopters, Ltd., Yeovil (England).
FRETTING IN HELICOPTERS
J. R. Lee *In* AGARD Specialists Meeting on Fretting in Aircraft Systems Jan. 1975 10 p (For availability see N75-22487 14-31)

N75-22491 United Aircraft Corp., Stratford, Conn. Sikorsky Aircraft.
FRETTING FATIGUE IN TITANIUM HELICOPTER COMPONENTS
M. J. Salkind *In* AGARD Specialists Meeting on Fretting in Aircraft Systems Jan. 1975 6 p refs (For availability see N75-22487 14-31)

N75-22499 Hydromecanique et Frottement, Andrezieux (France). Centre Stephanois de Recherches Mecaniques.
NEW POSSIBILITIES OFFERED BY SURFACE TREATMENT IN CONTRAST TO CONTACT CORROSION [NOUVELLES POSSIBILITIES OFFERTES PAR LES TRAITEMENTS DE SURFACE DANS LA LUTTE CONTRE LA CORROSION DE CONTACT]
A. Gonin, A. Berger, and J. J. Caubet *In* AGARD Specialists Meeting on Fretting in Aircraft Systems Jan. 1975 16 p refs In FRENCH (For availability see N75-22487 14-31)

N75-22512 Marshall of Cambridge (Engineering) Ltd. (England).
THE APPLICATION AND DEVELOPMENT OF AIRCRAFT STRUCTURAL TECHNOLOGY (SAFETY ETC.)
N. A. J. Harry *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 131-166 (For availability see N75-22504 14-31)

N75-22527 Industrieanlagen-Betriebsgesellschaft m.b.H., Ottobrunn (West Germany).
STRUCTURAL TEST PRINCIPLES FOR FULL SCALE AIRFRAMES AND THEIR APPLICATION TO THE SPACELAB TESTS
G. Bayerdoerfer *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 387-394 refs (For availability see N75-22504 14-31)

N75-22539 Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany).
A SEMI-AUTOMATIC MODAL-SURVEY TEST TECHNIQUE FOR COMPLEX AIRCRAFT AND SPACECRAFT STRUCTURES
E. Breitbach *In* ESRO Large Struct for Manned Spacecraft Mar. 1974 p 519-528 refs (For availability see N75-22504 14-31)

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography*.

N75-22851 Joint Publications Research Service, Arlington, Va.
AIRCRAFT DC THERMOANEMOMETER
V. P. Kukharets *In its* Meteorol. and Hydrology, No. 2, 1975 (JPRS-64670) 1 May 1975 p 135-139 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 12, 1975 p 108-110 (For availability see N75-22834 14-42)

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power*, *28 Propellants and Fuels*, and *44 Energy Production and Conversion*.

N75-22318*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
A MODEL AND PLAN FOR A LONGITUDINAL STUDY OF COMMUNITY RESPONSE TO AIRCRAFT NOISE
Walter J. Gunn, Harrold P. Patterson (Tracor, Inc., Austin, Tex.), June Cornog (NBS, Gaithersburg, Md.), Patricia Klaus (NBS, Gaithersburg, Md.), and William K. Connor (Tracor, Inc., Austin, Tex.) Apr. 1975 104 p refs
(NASA-TM-X-72690) Avail: NTIS HC $5.25 CSCL 20A

A new approach is discussed for the study of the effects of aircraft noise on people who live near large airports. The approach was an outgrowth of a planned study of the reactions of individuals exposed to changing aircraft noise conditions around the Dallas-Ft. Worth (DFW) regional airport. The rationale, concepts, and methods employed in the study are discussed. A critical review of major past studies traces the history of community response research in an effort to identify strengths and limitations of the various approaches and methodologies. A stress-reduction model is presented to provide a framework for studying the dynamics of human response to a changing noise environment. The development of the survey instrument is detailed, and preliminary results of pretest data are discussed. Author

N75-22319*# Kanner (Leo) Associates, Redwood City, Calif.
ANALYSIS OF THE VELOCITY DISTRIBUTION AT THE BLADE TIPS OF AXIAL-FLOW COMPRESSORS
H. Ufer Washington NASA May 1975 27 p Transl. into ENGLISH from Tech. Mitt. Krupp, Forschungsber., (West Germany), v. 26, no. 2, Oct. 1968 p 33-45
(Contract NASw-2481)
(NASA-TT-F-16366) Avail: NTIS HC $3.75 CSCL 21E

Velocity distribution at the blade tips of axial-flow compressors is analyzed on the basis of measurements and calculations. It is found that clearance flow has direct effect on flow at blade tips as well as indirect effect on flow as far as the hub. Good qualitative agreement was found between flow at stationary rectilinear cascades and at rotating cascades. Author

N75-22320*# Rockwell International Corp., Los Angeles, Calif.
TESTING OF LIFT/CRUISE FAN EXHAUST DEFLECTOR
Donald W. Schlundt Mar. 1975 68 p
(Contract NAS2-7657)
(NASA-CR-137682; NA-75-227) Avail: NTIS HC $4.25 CSCL 21E

A lift/cruise exhaust deflector system for the LF336/A tip turbine lift fan was designed, built, and tested to determine the design and performance characteristics of a large-scale, single swivel nozzle thrust vectoring system. The exhaust deflector static testing was performed at the Ames Research Center outside static test stand facilities. The test hardware was installed on a hydraulic lift platform to permit both in and out of ground effect testing. The exhaust flow of the LF336/A lift fan was vectored from 0 degrees through 130 degrees during selected fan speeds to obtain performance at different operating conditions. The system was operated with and without flow vanes installed in the small radius bends to evaluate the system performance based on a proposed method of improving the internal flow losses. The program also included testing at different ground heights, to the nozzle exhaust plane, to obtain ground effect data, and the testing of two methods of thrust spoiling using a duct bypass door system and nozzle flap system. Author

N75-22321*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
GAS SAMPLING METHOD FOR DETERMINING POLLUTANT CONCENTRATIONS IN THE FLAME ZONE OF TWO SWIRL-CAN COMBUSTOR MODULES
Robert A. Duerr Washington May 1975 25 p refs
(NASA-TM-X-3227; E-8211) Avail: NTIS HC $3.25 CSCL 21E

A gas sampling probe and traversing mechanism were developed to obtain detailed measurements of gaseous pollutant concentrations in the primary and mixing regions of combustors in order to better understand how pollutants are formed. The gas sampling probe was actuated by a three-degree-of-freedom traversing mechanism and the samples obtained were analyzed by an on-line gas analysis system. The pollutants in the flame zone of two different swirl-can combustor modules were measured at an inlet-air temperature of 590 K, pressure of 6 atmospheres, and reference velocities of 23 and 30 meters per second at a fuel-air ratio of 0.02. Typical results show large spatial gradients in the gaseous pollutant concentration close to the swirl-can module. Average concentrations of unburned hydrocarbons and carbon monoxide decrease rapidly in the downstream wake regions of each module. By careful and detailed probing, the effect of various module design features on pollutant formation can be assessed. The techniques presently developed seem adequate to obtain the desired information. Author

N75-22322*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ANALYSIS OF A STABILITY VALVE SYSTEM FOR EXTENDING THE DYNAMIC RANGE OF A SUPERSONIC INLET
John A. Webb, Jr. and Miles O. Dustin Washington May 1975 39 p refs
(NASA-TM-X-3219; E-8114) Avail: NTIS HC $3.75 CSCL 21E

A stability valve system designed for a full-scale, flight, supersonic, mixed-compression inlet was modeled dynamically by using analog computer techniques. The system uses poppet valves mounted in the inlet cowl to bypass airflow and augments the inlet shock position control system by preventing unstarts caused by high-frequency perturbations. The model was used as a design aid to investigate the effects of varying both the physical configurations of the valve and the flight and wind tunnel conditions. Results of the analysis indicate that the stability valve will provide a bandpass operation of 1 hertz to 17 hertz. Author

N75-22323*# AiResearch Mfg. Co., Phoenix, Ariz.
STUDY OF SMALL CIVIL TURBOFAN ENGINES APPLICABLE TO MILITARY TRAINER AIRPLANES Final Report
R. W. Heldenbrand, G. L. Merrill, and G. A. Burnett Apr. 1975 138 p refs
(Contract NAS2-6799)
(NASA-CR-137575; AiResearch-74-210987-a) Avail: NTIS HC $5.75 CSCL 21E

Small turbofan engine design concepts were applied to military trainer airplanes to establish the potential for commonality between civil and military engines. Several trainer configurations were defined and studied. A "best" engine was defined for the trainer mission, and sensitivity analyses were performed to determine the effects on airplane size and efficiency of wing loading, power loading, configuration, aerodynamic quality, and engine quality. It is concluded that a small civil aircraft is applicable to military trainer airplanes. Aircraft designed with these engines are smaller, less costly, and more efficient than existing trainer aircraft. Author

N75-22324*# Virginia Univ., Charlottesville.
STEADY-STATE AND TRANSIENT ANALYSIS OF A SQUEEZE FILM DAMPER BEARING FOR ROTOR STABILITY Final Report
L. E. Barrett and E. J. Gunter Washington NASA May 1975 108 p refs
(Grant NGL-47-005-050)
(NASA-CR-2548; ME-4040-114-73U) Avail: NTIS HC $5.25 CSCL 21E

A study of the steady-state and transient response of the squeeze film damper bearing is presented. Both the steady-state and transient equations for the hydrodynamic bearing forces are derived. The bearing equivalent stiffness and damping coefficients are determined by steady-state equations. These coefficients are used to find the bearing configuration which will provide the optimum support characteristics based on a stability analysis of

the rotor-bearing system. The transient analysis of rotor-bearing systems is performed by coupling the bearing and journal equations and integrating forward in time. The effects of unbalance, cavitation, and retainer springs are included in the analysis. Methods of determining the stability of a rotor-bearing system under the influence of aerodynamic forces and internal shaft friction are discussed with emphasis on solving the system characteristic frequency equation and on producing stability maps. It is shown that for optimum stability and low force transmissability the squeeze bearing should operate at an eccentricity ratio epsilon < 0.4. Author

N75-22325*# General Electric Co., Cincinnati, Ohio.
EXPERIMENTAL QUIET ENGINE PROGRAM Summary Report
W. G. Cornell Washington NASA Mar. 1975 127 p refs
(Contract NAS3-12430)
(NASA-CR-2519; R74AEG307) Avail: NTIS HC $5.75 CSCL 21E

Full-scale low-tip-speed fans, a full-scale high-tip-speed fan, scale model versions of fans, and two full-scale high-bypass-ratio turbofan engines, were designed, fabricated, tested, and evaluated. Turbine noise suppression was investigated. Preliminary design studies of flight propulsion system concepts were used in application studies to determine acoustic-economic tradeoffs. Salient results are as follows: tradeoff evaluation of fan tip speed and blade loading; systematic data on source noise characteristics and suppression effectiveness; documentation of high- and low-fan-speed aerodynamic and acoustic technology; aerodynamic and acoustic evaluation of acoustic treatment configurations, casing tip bleed, serrated and variable pitch rotor blades, leaned outlet guide vanes, slotted tip casings, rotor blade shape modifications, and inlet noise suppression; systematic evaluation of aerodynamic and acoustic effects; flyover noise projections of engine test data; turbine noise suppression technology development; and tradeoff evaluation of preliminary design high-fan-speed and low-fan-speed flight engines. Author

N75-22326# Advisory Group for Aerospace Research and Development, Paris (France).
SECONDARY POWER SYSTEMS FOR ADVANCED ROTORCRAFT
Raymond G. Smith (Boeing Vertol Co., Phila. Pa.) Feb. 1975 94 p refs
(AGARD-AG-206; AGARDograph-206) Avail: NTIS HC $4.75

The results are presented of a review of European manufactured Secondary Power Systems (SPS) for rotorcraft. A compilation of SPS functions, parametric SPS component data for optimization trade studies, and a trade study to select on optimum SPS are presented. The study addresses the aspects of integrated SPS (electrical, hydraulic, pneumatic and mechanical) concepts for cockpit and avionics environmental control systems, ice protection system, hoist drive system, main engine starting, auxiliary power unit and its starting system integration. System optimization and recommended selection are based on trade study parameters of weight, cost and product assurance. Author

N75-22327# Pisa Univ. (Italy). Ist. di Aeronautica.
CALCULATION OF AXISYMMETRICAL OSCILLATION OF FLEXIBLE TURBINE DISCS [CALCOLO DELLE OSCILLAZIONI ASSIALSIMMETRICHE FLESSIONALI DEI DISCHI DELLE TURBINE]
G. Nerli 1974 25 p refs In ITALIAN
(Rept-41) Avail: NTIS HC $3.25

The finite element method was applied to the problem of determining the proper frequency and vibration mode with reference to the oscillation for ringed turbine disks of arbitrary shape. The problem was formulated in terms of the coupling of the inertia modes, and the corresponding angular deformation. The effect of stress was considered. The value of the basic pulsation is calculated relative to the vibration mode for two cases, and the results compared to those of other methods.
Transl. by F.O.S.

N75-22328# Hughes Helicopters, Culver City, Calif.
OH-6A PROPULSION SYSTEM VIBRATION INVESTIGATION Final Report, 27 Nov. 1972 - 15 Jun. 1974
R. J. Sullivan, R. E. Head, G. J. Korkosz, J. R. Neff, and S. J. Soltis Jan. 1975 216 p refs
(Contract DAAJ02-73-C-0016; DA Proj. 1G1-62204-AA-72)
(AD-A007225; Rept-369-V-8009(HH-74-114); USAAMRDL-TR-74-85) Avail: NTIS CSCL 01/3

A study was made of means to improve helicopter engine/airframe vibratory interface compatibility. The study was based on the characteristics of the OH-6A helicopter and the T63 engine in order to utilize existing data to validate the methodology produced in the study. Available engine and airframe data was reviewed and used to prepare a vibration spectrum for a typical mission. Airframe mobility data was acquired during a ground shake test. A finite element model of the OH-6A airframe was prepared and was coupled to a model of the T63 engine, which was based on mobility data supplied by the engine manufacturer. The airframe and engine models were combined using a modal coupling technique, and reasonable correlation with test data was obtained. An impedance/mobility coupling technique is recommended where many flexible modes are in the frequency ranges that could be excited by main-rotor-induced vibratory forces. Based on the study, recommendations were prepared and circulated to engine manufacturers for future engine vibration specification, vibration parameter selection, and data reduction. The results of the survey and the proposed recommendations are presented. GRA

N75-22329# McDonnell Aircraft Co., St. Louis, Mo.
ANALYSIS AND SIMULATION OF VARIABLE THROTTLE/ENERGY MANAGEMENT CONCEPTS FOR FIGHTER AIRCRAFT Final Report, 29 Jun. 1973 - 1 Oct. 1974
G. G. Grose, R. J. Landy, R. G. Marsh, and R. D. Turner Nov. 1974 152 p refs
(Contract F33615-73-C-3130; AF Proj. 1987)
(AD-A006745; AFFDL-TR-74-138) Avail: NTIS CSCL 01/3

The application of a modified Rutowski logic to mission throttle/energy management was extended, investigating additional types of mission segments and providing a means of logically integrating optimum segments into mission profiles. Measurable fuel savings through throttle modulation were predicted for a demonstration flight mission for the F-4E airplane. A flight path and throttle control system was designed for following the optimum paths. A hybrid simulation plan was prepared. GRA

N75-22330# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
JET ENGINE THEORY (TURBOMACHINES), SELECTED CHAPTERS
B. S. Stechkin and P. K. Kazandzhan 22 Jan. 1975 308 p refs Transl. into ENGLISH from the book "Teoriya Reaktivnykh Dvigatelei, Lopatochnye Mashiny" 1956, p 34-56, 125-339, 545-548
(AD-A007175; FTD-HC-23-0086-75) Avail: NTIS CSCL 21/5

This book is intended for students of the aviation institutes and may be useful for scientific personnel and engineers working in the gas turbine engine field. It presents theory, design methods, and flow passage component profiling techniques, and examines the characteristics of compressors and turbines used in turbojet and turboprop engines. The authors have also used the literature available on rotor, stator and jet engine theory. GRA

N75-22331# General Motors Corp., Indianapolis, Ind. Detroit Diesel Allison Div.
T63 ENGINE VIBRATORY CHARACTERISTICS ANALYSIS Final Report, Dec. 1973 - Mar. 1974
W. H. Parker Jan. 1975 215 p refs
(DA Proj. 1G1-62204-AA-72)
(AD-A007243; DDA-EDR-8177; USAAMRDL-TR-74-87) Avail: NTIS CSCL 21/5

A study of the T63-A-5 engine vibratory environment installed in the OH-58 and OH-6 light observation helicopters is presented in this report. The purpose of the study is to develop a common language for use in engine/airframe (translational) vibration specifications and analyses related to future helicopter programs. Mobility and modal synthesis techniques for coupled dynamic system analyses are developed. These techniques are then applied to the aforementioned helicopter systems for evaluation. GRA

N75-22492* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FRETTING IN AIRCRAFT TURBINE ENGINES
Robert L. Johnson and Robert C. Bill *In* AGARD Specialists Meeting on Fretting in Aircraft Systems Jan. 1975 17 p refs Prepared in cooperation with Army Air Mobility R and D Lab., Cleveland (For availability see N75-22487 14-31)

N75-22493 Societe Nationale d'Etudes et de Construction de Moteurs Aeronautiques, Corbeil (France).
COMMENT ON WEAR OF NON-LUBRICATED PIECES IN TURBOMACHINES [COMMENT REDUIRE L'USURE DES PIECES NON LUBRIFIEES DANS LES TURBOMACHINES]
J. Thiery and R. Spinat *In* AGARD Specialists Meeting on Fretting in Aircraft Systems Jan. 1975 14 p In FRENCH; ENGLISH summary (For availability see N75-22487 14-31)

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N75-22332 Kansas Univ., Lawrence.
SOME METHODS FOR ANALYZING AIRCRAFT WITH LINEAR AUTOMATIC CONTROL SYSTEMS Ph.D. Thesis
Samuel Arthur Henry 1974 389 p
Avail: Univ. Microfilms Order No. 75-6193

Methods are presented for calculating the transfer functions for the response to control and disturbance inputs of aircraft with linear automatic control systems, and for determining the variance of aircraft and control surface motions in standard turbulence fields. Transfer functions of the aircraft with automatic controls are derived by incorporating the control system feedback path transfer functions into the LaPlace-transformed, linear, small perturbation equations of motion for the aircraft, and solving the equations by matrix methods. Algebraic and digital numerical solutions are presented. The aircraft and control surface motion variances are derived from standard turbulence power density spectra by using linear filtering techniques to obtain the aircraft motion spectra and the control deflection spectra, which are integrated numerically to obtain the variances. Dissert. Abstr.

N75-22333 Kansas Univ., Lawrence.
A SEPARATE SURFACE STABILITY AUGMENTATION SYSTEM FOR A GENERAL AVIATION AIRPLANE Ph.D. Thesis
Willard R. Bolton, Jr. and Donald Joe Collins 1974 300 p
Avail: Univ. Microfilms Order No. 75-6147

This report describes a design and development project undertaken to provide the benefits of full-time stability augmentation at a cost low enough to encourage application in general aviation aircraft. With attitude command, the automatic control system maintains aircraft attitude proportional to pilot control deflection despite disturbances such as atmospheric turbulence. Proposed aircraft modifications to achieve attitude command require subdividing each existing aerodynamic control surface into a pilot cable controlled segment, and a separate automatically controlled segment actuated by an electromechanical actuator. These separate surfaces, when used for stability augmentation, provide these benefits: (1) elimination of undesirable force feedback through pilot controls; (2) simple retrofit to existing aircraft or incorporation into new designs; (3) minimum hazards in failed states, and (4) low cost throught the elimination of control system redundancy. Dissert. Abstr.

N75-22334*# General Electric Co., Pittsfield, Mass. Environmental Electromagnetics Unit.
LIGHTNING EFFECTS ON THE NASA F-8 DIGITAL-FLY-BY-WIRE AIRPLANE Final Report
J. A. Plumer, F. A. Fisher, and L. C. Walko Washington NASA Mar. 1975 154 p refs
(Contract NAS4-2090)
(NASA-CR-2524; SRD-26-06) Avail: NTIS HC $6.25 CSCL 01C

The effects of lightning on a Digital Fly-By-Wire (DFBW) aircraft control system were investigated. The aircraft was a NASA operated F-8 fitted with a modified Apollo guidance computer. Current pulses similar in waveshape to natural lightning, but lower in amplitude, were injected into the aircraft. Measurements were made of the voltages induced on the DFBW circuits, the total current induced on the bundles of wires, the magnetic field intensity inside the aircraft, and the current density on the skin of the aircraft. Voltage measurements were made in both the line-to-ground and line-to-line modes. Voltages measured at the non-destructive test level were then scaled upward to determine how much would be produced by actual lightning. A 200,000 ampere severe lightning flash would produce between 40 and 2000 volts in DFBW circuits. Some system components are expected to be vulnerable to these voltages. Author

N75-22335*# Princeton Univ., N.J. Flight Research Lab.
THE LANDING FLARE: AN ANALYSIS AND FLIGHT-TEST INVESTIGATION
Edward Seckel Washington NASA May 1975 57 p refs (Contract NAS1-11231)
(NASA-CR-2517) Avail: NTIS HC $4.25 CSCL 01A

Results are given of an extensive investigation of conventional landing flares in general aviation type airplanes. A wide range of parameters influencing flare behavior are simulated in experimental landings in a variable-stability Navion. The most important feature of the flare is found to be the airplane's deceleration in the flare. Various effects on this are correlated in terms of the average flare load factor. Piloting technique is extensively discussed. Design criteria are presented. Author

N75-22336# Harry Diamond Labs., Washington, D.C.
PRECISION LINEAR FLIGHT
Dennis R. Cook Sep. 1974 19 p
(AD-A007134; HDL-TM-74-16) Avail: NTIS CSCL 01/3

An instrumentation system is described that enables a jet aircraft to maintain a linear high-angle dive path at constant speed. The density and motion of the air, as well as the mass, thrust, and drag configuration of the aircraft affect the performance of an aircraft diving toward a fixed point on the ground. Standard airborne instrumentation is insufficient to maintain a plus or minus one deg course and a plus or minus ten percent ground speed in a 30-deg dive. It was demonstrated in a series of test dives at various fixed angles that, by using ground based instrumentation, how these precisions could be attained over portions of the dive. GRA

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space).*

N75-22337*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
REAL-TIME COMPUTER DATA SYSTEM FOR THE 40- BY 80-FOOT WIND TUNNEL FACILITY AT AMES RESEARCH CENTER
Joseph M. Cambra and Geno P. Tolari Washington May 1975 39 p refs Prepared in cooperation with Informatics, Inc., Palo Alto, Calif.
(NASA-TN-D-7970; A-5751) Avail: NTIS HC $3.75 CSCL 14B

The background material and operational concepts of a computer-based system for an operating wind tunnel are described. An on-line real-time computer system was installed in a wind tunnel facility to gather static and dynamic data. The computer system monitored aerodynamic forces and moments of periodic and quasi-periodic functions, and displayed and plotted computed results in real time. The total system is comprised of several off-the-shelf, interconnected subsystems that are linked to a large data processing center. The system includes a central processor

unit with 32,000 24-bit words of core memory, a number of standard peripherals, and several special processors; namely, a dynamic analysis subsystem, a 256-channel PCM-data subsystem and ground station, a 60-channel high-speed data acquisition subsystem, a communication link, and static force and pressure subsystems. The role of the test engineer as a vital link in the system is also described. Author

N75-22338# Institut Franco-Allemand de Recherches, St. Louis (France).
EXPERIMENTS ON THE SIMULATION OF ATOMIC EXPLOSION SHOCK WAVES AND ON THE PROPAGATION OF SUCH SHOCK WAVES IN TUBES [VERSUCHE ZUR SIMULATION VON LUFTSTOSSWELLEN BEI ATOMEXPLOSIONEN UND ZUR FORTPFLANZUNG SOLCHER WELLEN IN ROHREN]
M. Froboese, H. P. Mehlin, G. Mathieu, and G. Parmentier 11 Apr. 1974 117 p refs In GERMAN Sponsored in part by Bundesmin. fuer Verteidigung Prepared jointly with Ernst-Machinst.
(Contract DTEN-72.170)
(ISL-13/74) Avail: NTIS HC $5.25

In order to simulate atomic explosions, shock waves were generated in a ca. 70 m long tube, diameter 30 cm, in three different ways: detonation of explosives, lighting of explosive methane-air mixtures, and expansion of compressed air. The pressure distribution of the waves was measured at 15 points along the shock tube. The results were compared using oscillograms p(t) and diagrams p(r). ESRO

N75-22339# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
STUDY OF THE PROCESS OF THE STARTING-UP THE DIFFUSER OF SUPERSONIC WIND TUNNEL WITH EIFFEL CHAMBER
A. M. Bespalov, A. G. Mikhalchenko, and V. G. Serebryakov 15 Jan. 1975 28 p refs Transl. into ENGLISH from Tsentr. Aerogidrodinam. Inst., Uch. Zap. (USSR), v. 4, no. 2, 1973 p 125-132
(AD-A006695; FTD-MT-24-489-75) Avail: NTIS CSCL 14/2

Results from an experimental study on the process of starting the diffuser of a supersonic wind tunnel with Eiffel's chambers are reported. The chamber design-conical nozzles with Mach number 2.27 and cylindrical diffusers of different length and diameter was discussed. It was shown that the stabilization of flow in the diffuser is related to the formation of a shock in the vicinity of the jet attachment point. Author

N75-22340# Naval Air Development Center, Warminster, Pa. Air Vehicle Technology Dept.
PROGRAM PLAN FOR INVESTIGATION OF MODEL S-2 AIRPLANE CATAPULT AND HOLD BACK OPERATIONS CAPACITY
Henry Lystad 13 Feb. 1975 27 p refs
(AD-A006892; NADC-75014-30) Avail: NTIS CSCL 01/3

A laboratory fatigue test will be performed on an S-2 airframe to determine whether the airframe will sustain the effects of 3,000 catapult launches without structural failure. GRA

N75-22341# Army Construction Engineering Research Lab., Champaign, Ill.
PAVEMENT FUNCTIONAL CONDITION INDICATORS Final Report
Mohamed Y. Shahin and Michael I. Darter Feb. 1975 95 p refs
(DA Proj. 4A6-64717-D-895)
(AD-A007152; CERL-TR-C-15) Avail: NTIS CSCL 01/5

Functional performance is defined as the trend of the level of service provided to the pavement users through the initial life of the pavement and between major rehabilitations. The information presented in this report includes: (1) identification of pavement functional condition indicators; (2) state of the art of measuring and evaluating the most significant functional indicators (roughness and skid resistance); and (3) preliminary concepts for incorporating functional consideration into pavement life-cycle analysis. The report covers pavements in general, with special consideration given to airfields. GRA

N75-22342# Naval Training Equipment Center, Orlando, Fla.
ANALYSIS OF AN ALTITUDE CONTROL SYSTEM FOR A HIGH ALTITUDE RAPID DECOMPRESSION CHAMBER Final Report
Richard C. Rapson, Jr. 13 Feb. 1975 10 p
(AD-A006568; NAVTRAEQUIPC-TN-43) Avail: NTIS CSCL 06/2

An analysis of a high altitude rapid decompression chamber is presented with respect to the feasibility of installing an automatic altitude control system. Consideration is given to the precision of control required and the hardware available to use in implementation. It is concluded that automatic control of such a device is within the state of the art. GRA

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration*.

N75-22343*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
REAL TIME SOLAR MAGNETOGRAPH SKYLAB MISSION ATLAS
M. J. Hagyard and N. P. Cumings Mar. 1975 106 p refs
(NASA-TM-X-64922) Avail: NTIS HC $5.25 CSCL 22A

An atlas of all magnetic field observations made during the Skylab missions with the Real Time Solar Magnetograph system located at the Marshall Space Flight Center is presented. Also included are a description of the system and its operation; an outline of the data reductions performed; and a discussion of probable errors, noise, magnetic sensitivity, and system reliability. Author

N75-22344*# IIT Research Inst., Chicago, Ill.
SPACE PROCESSING OF CHALCOGENIDE GLASSES Annual Report, 22 Feb. 1974 - 21 Feb. 1975
D. C. Larsen and M. A. Ali 15 Apr. 1975 40 p refs
(Contract NAS8-30627; IITRI Proj. D6096)
(NASA-CR-120745; AR-1) Avail: NTIS HC $3.75 CSCL 04A

Chalcogenide glasses are discussed as good infrared transmitters, possessing the strength, corrosion resistance, and scale-up potential necessary for large 10.6-micron windows. The disadvantage of earth-produced chalcogenide glasses is shown to be an infrared absorption coefficient which is unacceptably high relative to alkali halides. This coefficient is traced to optical nonhomogeneities resulting from environmental and container contamination. Space processing is considered as a means of improving the infrared transmission quality of chalcogenides and of eliminating the following problems: optical inhomogeneities caused by thermal currents and density fluctuation in the 1-g earth environment; contamination from the earth-melting crucible by oxygen and other elements deleterious to infrared transmission; and, heterogeneous nucleation at the earth-melting crucible-glass interface. L.B.

N75-22345*# Colorado State Univ., Fort Collins. Dept. of Electrical Engineering.
APPLICATION OF ELECTROHYDRODYNAMIC PHENOMENA TO SPACE PROCESSING Final Report
Thomas B. Jones Mar. 1975 78 p refs
(Contract NAS8-30250)
(NASA-CR-120445) Avail: NTIS HC $4.75 CSCL 22A

The capabilities of electrohydrodynamic (EHD) unit separation, liquid handling/control, and mixing are introduced to industrial chemists and metallurgists, working on specific zero-gravity processes. Previously proposed zero-gravity applications of EHD are presented along with the prominent electrohydrodynamical force effects. Author

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

N75-22346 New York Univ., N.Y.
PERIODIC AND QUASIPERIODIC SATELLITE ORBITS IN THE GRAVITATIONAL FIELD OF A ROTATING, NON-AXIALLY-SYMMETRIC PLANET Ph.D. Thesis
Peter Carl Kammeyer 1974 111 p
Avail: Univ. Microfilms Order No. 75-9667

Several types of satellite orbits around a rotating, nearly spherical, non-axially-symmetric planet are studied. The orbits studied have osculating ellipses of periods nearly commensurable with the planet's rotation period, and they are periodic or quasiperiodic in coordinates rotating with the planet. The following types of periodic orbit are found: (1) nearly circular orbits inclined to the equator, not at critical inclination, (2) noncircular orbits at critical inclination, and (3) noncircular orbits near the equatorial plane. Existence proofs proceed by Poincare's method of surface of section, with the implicit function theorem used in cases (1) and (3) and the Birkhoff fixed point theorem in case (2) to give the required fixed point. Linear orbital stability of orbits of types (1) and (3) is discussed; it is of particular interest that under certain circumstances resonance does not lead to instability.
Dissert. Abstr.

N75-22347 Michigan Univ., Ann Arbor.
AN IMPROVED CHAPMAN THEORY FOR STUDYING ENTRY INTO PLANETARY ATMOSPHERES Ph.D. Thesis
Fred Colignon Brace, II 1974 154 p
Avail: Univ. Microfilms Order No. 75-10137

The motion of a space vehicle which is entering a planetary atmosphere is analyzed. The three-dimensional motion of a space vehicle over a spherical planet is considered. It is assumed that the vehicle is moving through an isothermal atmosphere under the action of an inverse-square gravitational force. Exact equations of motion are derived in terms of the flight path angle and Chapman's Z bar and u bar variables. No restrictive assumptions regarding the nature of the trajectory are necessary in the derivation. The equations are valid for three-dimensional motion. Even though no restrictive assumptions are necessary in the derivation, the equations possess all the desirable aspects of Chapman's original equation. Because Z bar is approximately zero at high altitudes, an entry trajectory is specified in terms of only three parameters: the initial flight path angle, the initial speed of the vehicle, and lambda where lambda is the lift-drag ratio times the cosine of the bank angle. Thus, three-dimensional motion is analyzed in terms of the exact equations in the same manner that two-dimensional motion is analyzed in terms of Chapman's approximate equation. Dissert. Abstr.

N75-22348*# Cincinnati Univ., Ohio. Dept. of Mathematics.
ANALYTICAL THEORY FOR ARTIFICIAL SATELLITES Final Technical Report
Andre Deprit 15 May 1975 5 p refs
(Grant NGR-36-004-068)
(NASA-CR-142706) Avail: NTIS HC $3.25 CSCL 22A

A theory for generating segmented ephemerides is discussed as a means for fast generation and simple retrieval of nominal orbit data. Over a succession of finite intervals of time, the orbit is represented by a best approximation expressed by Chebyshev polynomials. Storage of coefficients tables for Chebyshev polynomials is seen as a method to reduce data and decrease transmission costs. A general algorithm was constructed and computer programs were designed. The possibility of storing an ephemeris for a few days in the on-board computer, or in microprocessors attached to the data collectors is suggested. L.B.

N75-22349*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GENERAL RELATIVITY AND SATELLITE ORBITS
David Parry Rubincam Mar. 1975 41 p refs Submitted for publication
(NASA-TM-X-70880; X-921-75-56) Avail: NTIS HC $3.75 CSCL 22A

The general relativistic correction to the position of a satellite is found by retaining Newtonian physics for an observer on the satellite and introducing a potential. The potential is expanded in terms of the Keplerian elements of the orbit and substituted in Lagrange's equations. Integration of the equations shows that a typical earth satellite with small orbital eccentricity is displaced by about 17 cm. from its unperturbed position after a single orbit, while the periodic displacement over the orbit reaches a maximum of about 3 cm. The moon is displaced by about the same amounts. Application of the equations to Mercury gives a total displacement of about 58 km. after one orbit and a maximum periodic displacement of about 12 km. Author

N75-22350*# Martin Marietta Corp., Denver, Colo. Planetary Systems Mission Analysis and Operations Section.
MISSION ANALYSIS PROGRAM FOR SOLAR ELECTRIC PROPULSION (MAPSEP). VOLUME 1: ANALYTICAL MANUAL FOR EARTH ORBITAL MAPSEP
Apr. 1975 88 p refs Revised
(Contract NAS8-29666)
(NASA-CR-120406) Avail: NTIS HC $4.75 CSCL 22A

An introduction to the MAPSEP organization and a detailed analytical description of all models and algorithms are given. These include trajectory and error covariance propagation methods, orbit determination processes, thrust modeling, and trajectory correction (guidance) schemes. Earth orbital MAPSEP contains the capability of analyzing almost any currently projected low thrust mission from low earth orbit to super synchronous altitudes. Furthermore, MAPSEP is sufficiently flexible to incorporate extended dynamic models, alternate mission strategies, and almost any other system requirement imposed by the user. As in the interplanetary version, earth orbital MAPSEP represents a trade-off between precision modeling and computational speed consistent with defining necessary system requirements. It can be used in feasibility studies as well as in flight operational support. Pertinent operational constraints are available both implicitly and explicitly. However, the reader should be warned that because of program complexity, MAPSEP is only as good as the user and will quickly succumb to faulty user inputs. Author

N75-22351*# Martin Marietta Corp., Denver, Colo. Planetary Systems Mission Analysis and Operations Section.
MISSION ANALYSIS PROGRAM FOR SOLAR ELECTRIC PROPULSION (MAPSEP). VOLUME 2: USER'S MANUAL FOR EARTH ORBITAL MAPSEP
Apr. 1975 178 p refs Revised
(Contract NAS8-29666)
(NASA-CR-120407) Avail: NTIS HC $7.00 CSCL 22A

The trajectory simulation mode (SIMSEP) requires the namelist SIMSEP to follow TRAJ. The SIMSEP contains parameters which describe the scope of the simulation, expected dynamic errors, and cumulative statistics from previous SIMSEP runs. Following SIMSEP are a set of GUID namelists, one for each guidance correction maneuver. The GUID describes the strategy, knowledge or estimation uncertainties and cumulative statistics for that particular maneuver. The trajectory display mode (REFSEP) requires only the namelist TRAJ followed by scheduling cards, similar to those used in GODSEP. The fixed field schedule cards define: types of data displayed, span of interest, and frequency of printout. For those users who can vary the amount of blank common storage in their runs, a guideline to estimate the total MAPSEP core requirements is given. Blank common length is related directly to the dimension of the dynamic state (NDIM) used in transition matrix (STM) computation, and, the total augmented (knowledge) state (NAUG). The values of program and blank common must be added to compute the total decimal core for a CDC 6500. Other operating systems must scale these requirements appropriately. Author

N75-22352*# Martin Marietta Corp., Denver, Colo. Planetary Systems Mission Analysis and Operations Section.
MISSION ANALYSIS PROGRAM FOR SOLAR ELECTRIC PROPULSION (MAPSEP). VOLUME 3: PROGRAM MANUAL FOR EARTH ORBITAL MAPSEP
Apr. 1975 564 p
(Contract NAS8-29666)
(NASA-CR-120408) Avail: NTIS HC $13.00 CSCL 22A

A revised user's manual for the computer program MAPSEP is presented. Major changes from the interplanetary version of MAPSEP are summarized. The changes are intended to provide a basic capability to analyze anticipated solar electric missions, and a foundation for future more complex, modifications. For Vol. III, N75-16589. Author

N75-22353# Royal Aircraft Establishment, Bedford (England).
GEOPOTENTIAL HARMONICS OF ORDER 15 AND EVEN DEGREE, FROM CHANGES IN ORBITAL ECCENTRICITY AT RESONANCE
D. G. King-Hele, Doreen M. C. Walker, and R. H. Gooding Sep. 1974 33 p refs
(RAE-TR-74120; BR43091) Avail: NTIS HC $3.75

The variation in eccentricity of six satellites at inclination between 56 and 90 deg to determine values of the 15th order coefficients of degree 16, 18, 20, and 22 is reported. Six near-circular satellite orbits that slowly passed the 15th-order resonance under the action of air drag were selected. The variations in eccentricity were analyzed using the THROE computer program. The analysis yielded 11 pairs of equations linking the geopotential coefficients of order 15 and degree 16, 18. These equations together with the restraint equations were solved for various numbers of coefficients, and the best solution is for four coefficients, i.e. for degree 16, 18, 20, and 22. These values seem to be basically reliable, and an increase of 50% in the formal standard deviations of the coefficients should convert them into realistic error estimates. ESRO

N75-22354# Aerospace Research Labs., Wright-Patterson AFB, Ohio.
RESEARCH ON HYPERSONIC STABILITY PROBLEMS Final Report, 1963 - 1974
O. Walchner Dec. 1974 13 p refs
(AF Proj. 7064)
(AD-A007045; ARL-74-0140) Avail: NTIS CSCL 16/4

This final report summarizes the in-house research work on hypersonic stability problems, applicable to reentry dynamics. During the period 1963 to 1974 research contributions were made in the following areas: (1) Static and dynamic stability in pitch; (2) hypersonic roll damping; (3) asymmetric nose effects; (4) non linear aerodynamics; (5) stability coefficients in nonplanar motions. This in-house research effort was terminated as of 1 July 1974. GRA

N75-22355# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.
REENTRY GUIDANCE SYSTEM STUDIES Final Report for Fiscal Year 1974
W. McFarland, R. Carson, and R. Setterlund Jul. 1974 57 p
(Contract F04701-73-C-0019)
(AD-A006808; SAMSO-TR-75-58; R-834) Avail: NTIS CSCL 16/3

The report discusses the constraints imposed by 'dormancy' or rapid readiness upon reentry guidance systems and addresses: (1) Inflight alignment of the reentry inertial measurement unit with the booster inertial measurement unit; (2) progress in the derivation of instrument performance models; and (3) the development of a technique for obtaining single-level torquing by increasing instrument quantization with an 'interpolator'. GRA

N75-23396 Hamburg Univ. (West Germany). Lehrstuhl fuer Theoretische Physik.
THE HELIOS EXPERIMENT ON THEORIES OF GRAVITATION
W. Kundt *In* Arbeitsgemeinschaft fuer Weltraumforsch. Helios Satellite Sci. Data Evaluation Oct. 1974 p 15-17 (For availability see N75-23393 14-88)

N75-23397 Hamburg Univ. (West Germany). Lehrstuhl fuer Theoretische Physik.
HELIOS PERTURBATIONS
W. Kundt *In* Arbeitsgemeinschaft fuer Weltraumforsch. Helios Satellite Sci. Data Evaluation Oct. 1974 p 18-22 (For availability see N75-23393 14-88)
Avail: NTIS

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air)*.

N75-22356*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
A DEVICE FOR INSTALLING ROCKET ENGINES Patent Application
Thomas R. George, Jr., inventor (to NASA) (Rocketdyne, Canoga Park, Calif.) Filed 25 Apr. 1975 16 p Sponsored by NASA (NASA-Case-MFS-19220-1; US-Patent-Appl-SN-571821) Avail: NTIS HC $3.25 CSCL 13I

A device for installing rocket engines at a severe cant relative to vertical, while maintaining uniform loading at the thrust chamber exit is proposed. The device is characterized by an axially extensible, tiltable pedestal, a lifting platform for supporting a rocket engine at its thrust chamber exit, a mount with a concentric base characterized by a concave bearing surface, a plurality of uniformly spaced legs extended radially from the base, and an annular receiver coaxially aligned with the base and affixed to the distal ends of the legs for receiving the thrust chamber exit. The lifting platform is concentrically related to the pedestal and is coupled to the extended end portion through a convex bearing surface for accommodating a rocking motion of the platform about an axis angularly related to the longitudinal axis of the pedestal. Mated curved bearing surfaces are employed for coupling a tiltable lifting platform with a pedestal and adapted to support rocket engines at the thrust chamber exits. NASA

N75-22357# Code Research Corp., Anaheim, Calif.
CLOSED LOOP REAL-TIME EVALUATION OF MISSILE GUIDANCE AND CONTROL COMPONENTS: SIMULATOR HARDWARE/SOFTWARE CHARACTERISTICS AND USE Final Technical Report
A. C. Jolly, L. H. Hazel, and R. J. Vinson Aug. 1974 128 p refs
(Contract DAAH01-74-C-0193)
(AD-A006555; USAMICOM-74-3) Avail: NTIS CSCL 16/2

Descriptions of the simulation facility hardware components, their performance characteristics and methods of utilization are scattered in a diversity of reference and instruction manuals which do not lend themselves to yielding a rapid overall grasp of the capability and operation of the facility. The intent of the report is to remedy this situation by providing a summary of the list of components which comprise the facility, a brief description of their characteristics and methods of use and any other salient points of particular interest to the potential user. It should be noted that the hybrid computer software components are considered essential parts of the simulation facility. GRA

N75-22530 Aeritalia, Turin (Italy).
SURVEY OF AERITALIA'S ACTIVITIES IN THE AEROSPACE FIELD
P. M. Massa *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 403-427 refs (For availability see N75-22504 14-31)

N75-22531 Lockheed Missiles and Space Co., Sunnyvale, Calif.
STRUCTURAL DYNAMIC TESTING CONSIDERATIONS FOR LARGE SPACE VEHICLES
R. J. Herzberg *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 429-439 (For availability see N75-22504 14-31)

N75-22533 Societe Europeene d'Etudes et d'Essais d'Environnement, Buc (France).
ACOUSTICAL ENVIRONMENT OF SPACE VEHICLES AND MEANS FOR GROUND SIMULATION [L'ENVIRONNEMENT ACOUSTIQUE DES ENGINS SPATIAUX ET LES MOYENS DE SA SIMULATION AU SOL]
J. E. Gilly *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 447-466 refs In FRENCH (For availability see N75-22504 14-31)

N75-22534 British Aircraft Corp. (Operating) Ltd., Bristol (England).
MECHANICAL VERSUS ACOUSTIC VIBRATION TESTING
M. L. Abrahams *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 467-474 refs (For availability see N75-22504 14-31)

N75-22535 Commissariat a l'Energie Atomique, Le Barp (France). Centre d'Etudes Scientifiques et Techniques d'Aquitaine.
DESCRIPTION OF ENVIRONMENTAL TEST FACILITY COMBINING THE CENTRIFUGATION AND VIBRATION [DESCRIPTION D'UN ESSAI D'ENVIRONNEMENT COMBINE CENTRIFUGATION ET VIBRATION]
D. LeLuhandre *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 475-484 In FRENCH (For availability see N75-22504 14-31)

N75-22537 Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
ONERA (MODANE AND PALAISEAU) MEANS FOR ACHIEVING THE TESTS ON LARGE SIZE AEROSPACE STRUCTURES [LES MOYENS DES CENTRES ONERA DE MODANE ET PALAISEAU UTILISABLES POUR DES ESSAIS DE STRUCTURES SPATIALES DE GRANDES DIMENSIONS]
J. Laverre and J. Vaillant *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 497-509 refs In FRENCH (For availability see N75-22504 14-31)

N75-22540 Societe pour le Perfectionnement des Materiels et Equipements Aerospatiaux, Velizy-Villacoublay (France).
MOBILE SOPEMEA VIBRATION TEST FACILITY FOR THE EXPERIMENTAL DETERMINATION OF NORMAL MODES OF COMPLEX STRUCTURES [INSTALLATION MOBILE D'ESSAIS AUX VIBRATIONS DE LA SOPEMEA POUR LA DETERMINATION EXPERIMENTALE DES MODES PROPRES DES STRUCTURES COMPLEXES]
M. Porta *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 529-542 In FRENCH (For availability see N75-22504 14-31)

N75-22541 Societe pour le Perfectionnement des Materiels et Equipements Aerospatiaux, Velizy-Villacoublay (France).
MECHANICAL TEST MEANS FOR DANGEROUS SPECIMENS [LES MOYENS D'ESSAIS MECANIQUES POUR SPECIMENS DANGEREUX]
J. Y. Canihac *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 543-549 In FRENCH (For availability see N75-22504 14-31)

N75-22542 Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Porz (West Germany).
FATIGUE TESTS IN VACUUM AT DIFFERENT TEMPERATURES
M. Boehmer and D. Munz *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 551-556 refs (For availability see N75-22504 14-31)

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N75-22358* National Aeronautics and Space Administration, Washington, D.C.
NIMBUS-F TO CARRY ADVANCED WEATHER INSTRUMENTS
8 Jun. 1975 23 p
(NASA-News-Release-75-145) Avail: NASA Scientific and Technical Information Facility P. O. Box 8757 Balt/Wash International Airport, Md. 21240 CSCL 22B

Meteorological research instruments launched aboard NASA's Nimbus-F spacecraft are briefly described along with the Nimbus satellite program initiated to develop an observatory system capable of meeting the research and development needs of the nation's atmospheric and earth sciences program. The following aspects of the mission are described: spacecraft design, launch operations, sequence of orbital events, and operations control and tracking. The Global Atmospheric Research program is discussed in terms of the Nimbus-F experiments and atmospheric sounding instruments. J.M.S.

N75-22359# Royal Observatory, Edinburgh (Scotland). Satellite Tracking Section.
STOPWATCH OBSERVATIONS OF SATELLITES, OCTOBER 1974
R. D. Eberst 19 Nov. 1974 30 p
(ROE-STS-195) Avail: NTIS HC $3.75

Stopwatch observations made at stations during October 1974 are listed in satellite launch and time order: 533 fully reduced observations of 148 satellites. ESRO

N75-22360# Royal Observatory, Edinburgh (Scotland). Satellite Tracking Section.
STOPWATCH OBSERVATIONS OF SATELLITES, NOVEMBER 1974
R. D. Eberst 12 Dec. 1974 34 p
(ROE-STS-196) Avail: NTIS HC $3.75

Stopwatch observations made at stations during November 1974 are listed in satellite launch and time order: 676 fully reduced observations of 154 satellites. ESRO

N75-22361# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Porz (West Germany).
THE HELIOS DESPIN DRIVE ASSEMBLY AND ITS BEARING SYSTEM
E. J. W. Muller Paris ESRO 1975 21 p Presented at the European Space Tribology Symp., Frascati, Italy, 9-11 Apr. 1975
Avail: NTIS HC $3.25

Space environment tests of the Helios despin drive assembly are reported. A random vibration test was performed before the assembly was put into the thermal vacuum chamber. During the thermal vacuum tests, it turned out that the fabrication method was not optimal. A solar simulation test was carried out to improve the thermal design of the spacecraft and its components. Due to the test results, a redesign was necessary. A thermal gradient test was carried out to check the design changes necessary for obtaining higher temperatures and lower thermal gradients in the cold mission phase. Some inflight data are described. ESRO

N75-22362# Teldix Luftfahrt-Ausruestungs G.m.b.H., Heidelberg (West Germany).
DESIGN AND LUBRICATION OF BALL BEARING UNIT FOR FLYWHEELS
Werner Auer Paris ESRO 1975 25 p refs Presented at the European Space Tribology Symp., Frascati, Italy, 9-11 Apr. 1975
Avail: NTIS HC $3.25

Due to the application of relatively large ball bearings, which are only loaded to about 1% of their dynamic load carrying capability, long life and high reliability can be achieved. The bearings are able to withstand severe launch loads without a load relief mechanism if a damped flywheel rim is employed. Due to friction torque and power requirements, the ball bearings had to be lubricated with little, but sufficient, oil for EHD film generation. A lubrication reservoir maintains vapor pressure in the bearing unit in case of housing leakage and supplies lubricant throughout the mission duration. ESRO

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

No abstracts in this category.

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications.*

N75-22363 Southern Methodist Univ., Dallas, Tex.
ON SIGNALS OVER MULTIPATH CHANNELS FOR AERONAUTICAL COMMUNICATION Ph.D. Thesis
Gurpartap Singh Takhar 1974 113 p
Avail: Univ. Microfilms Order No. 75-8017

The general problem of communication over aeronautical fading channels is discussed in detail. For signals observed as discrete-time sequences, a demodulator structure based on the extended Kalman filter algorithms is developed for continuous-time angle modulated signals. The demodulation algorithms developed for aeronautical communication are simplified for communication between a synchronous satellite and a ground station. The associated propagation delay is of the order of 0.25 second. The simulation results show that the algorithms perform well in the presence of such large delays. For digital signals over satellite communication channels, a non-recursive MAP detector structure is developed. An upper bound on the probability of error is derived and numerically evaluated for several AM-PM signal sets. Dissert. Abstr.

N75-22364*# Washington Univ., St. Louis, Mo. Center for Development Technology.
MARKET SCENARIOS AND ALTERNATIVE ADMINISTRATIVE FRAMEWORKS FOR US EDUCATIONAL SATELLITE SYSTEMS
John. E. Walkmeyer, Jr., Robert P. Morgan, and Jai P. Singh Apr. 1975 169 p refs
(Grant NGR-26-008-054)
(NASA-CR-142711; CG-75/2) Avail: NTIS HC $6.25 CSCL 17B

Costs and benefits of developing an operational educational satellite system in the U.S. are analyzed. Scenarios are developed for each educational submarket and satellite channel and ground terminal requirements for a large-scale educational telecommunications system are estimated. Alternative organizational frameworks for such a system are described. J.M.S.

N75-22365*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
TELEMETRY SYNCHRONIZER Patent Application
Carroll T. Pardoe, inventor (to NASA) (APL) Filed 4 Apr. 1975 39 p Sponsored by NASA
(NASA-Case-GSC-11868-1; US-Patent-Appl-SN-565290) Avail: NTIS HC $3.75 CSCL 17B

A telemetry data synchronizer for achieving phase lock and synchronization of an input signal having a pseudorandom sequence is presented. The apparatus is characterized by a delay lock loop adapted to be responsive to an L format biphase signal having a pseudorandom sequence and utilizing only digital circuitry. NASA

N75-23468 Joint Publications Research Service, Arlington, Va.
FIRST TELECAST BY SATELLITE IS SUCCESSFUL
Kiril S. Serafimov *In its* Transl. on Eastern Europe: Sci. Affairs, No. 463 (JPRS-64694) 5 May 1975 p 17-19 Transl. into ENGLISH from Spisanie Bulgar. Akad. Nauk. (Sofia), no. 4, 1974 p 70-72 (For availability see N75-23465 14-99)

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support.* For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics.*

N75-22366*# Texas Univ., Austin. Dept. of Aerospace Engineering and Engineering Mechanics.
THE EFFECT OF SURFACE TEMPERATURE AND REYNOLDS NUMBER ON THE LEEWARD HEAT-TRANSFER FOR A SHUTTLE ORBITER
John J. Bertin, Gobporn Senalug, Marilynn McBride, and R. Bruce Willman Apr. 1975 152 p refs
(Contract NAS9-13707)
(NASA-CR-141781; Rept-75002) Avail: NTIS HC $6.25 CSCL 22B

The effect of windward surface temperature on the heat transfer to the leeward surface of the shuttle orbiter was investigated. Heat-transfer distributions, surface-pressure distributions, and schlieren photographs were obtained for an 0.01-scale model of the 37-0 shuttle orbiter at angles-of-attack of 30 deg and of 40 deg. Similar data were obtained for a fuselage-only configuration at angles-of-attack of 30 deg and of 90 deg. Data were obtained for various Mach numbers, Reynolds numbers, and surface temperatures. Author

N75-22367*# Howard Univ., Washington, D.C. Dept. of Mechanical Engineering.
THE DYNAMICS OF SPIN STABILIZED SPACECRAFT WITH MOVABLE APPENDAGES, PART 1 Final Report
Peter M. Bainum and R. Sellappan May 1975 121 p refs
(Grant NGR-09-011-053)
(NASA-CR-142703) Avail: NTIS HC $5.25 CSCL 22B

The motion and stability of spin stabilized spacecraft with movable external appendages are treated both analytically and numerically. The two basic types of appendages considered are: (1) a telescoping type of varying length and (2) a hinged type of fixed length whose orientation with respect to the main part of the spacecraft can vary. Two classes of telescoping appendages are considered: (a) where an end mass is mounted at the end of an (assumed) massless boom; and (b) where the appendage is assumed to consist of a uniformly distributed homogeneous mass throughout its length. For the telescoping system Eulerian equations of motion are developed. During all deployment sequences it is assumed that the transverse component of angular momentum is much smaller than the component along the major spin axis. Closed form analytical solutions for the time response of the transverse components of angular velocities are obtained when the spacecraft hub has a nearly spherical mass distribution. Author

N75-22368*# Chrysler Corp., New Orleans, La. Data Management Services.
RESULTS OF INVESTIGATIONS WITH AN 0.015-SCALE MODEL (49-0) OF THE ROCKWELL INTERNATIONAL SPACE SHUTTLE VEHICLE 140A/B CONFIGURATION WITH MODIFIED OMS PODS AND ELEVONS IN THE AEDC VKF TUNNEL B (0A79) Space Shuttle
V. Esparza (Rockwell Intern. Space Div.) and A. I. Lindsay (Rockwell Intern. Space Div.) Apr. 1975 541 p
(Contract NAS9-13247)
(NASA-CR-141531; DMS-DR-2199) Avail: NTIS HC $12.50 CSCL 22B

Aerodynamic data obtained from wind tunnel tests of an 0.015-scale space shuttle vehicle Orbiter model of a 140A/B configuration with modified orbital manuevering system pods and elevons are documented. Force data was obtained at various

control surface settings and Reynolds numbers in the angle of attack range of 15 deg to 45 deg and at angles of sideslip of -5 deg to +5 deg. Control surface variables included elevon, rudder, speed brake, and body flap configurations. Author

N75-22369# Institute for Defense Analyses, Arlington, Va.
WEIGHT PREDICTION METHOD FOR SPACE TUG Final Report
Gerald Corning Jun. 1974 36 p refs
(Contract DAHC15-73-C-0200)
(AD-A006987; P-1027; IDA/HQ-74-16219) Avail: NTIS CSCL 22/2

This study presents formulas to predict the dry weights of an efficient space tug, for both storable and cryogenic propellants, as a function of propellant weight, engine thrust, and number of engines. An efficient vehicle, as used here, is the one with the lowest dry weight, which is equivalent to the highest mass fraction. GRA

N75-22507 Dornier-System G.m.b.H., Friedrichshafen (West Germany).
STRUCTURAL DYNAMIC OPTIMISATION OF SATELLITES
H. Roehrle *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 43-52 refs (For availability see N75-22504 14-31)

N75-22508 Ruhr Univ., Bochum (West Germany).
THE ANALYTICAL REPRESENTATION OF DAMPING IN THE DYNAMICS OF STRUCTURES
G. Schmid and H. Roehrle (Dornier System GmbH, Friedrichshafen, West Ger.) *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 53-64 refs Sponsored by Deut. Ges. fuer Weltraumforsch. (For availability see N75-22504 14-31)

N75-22509 Engins Matra, Velizy (France).
ANALYSIS OF THERMAL DISTORTION OF LARGE SPACECRAFT ANTENNAS
H. Larsson *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 65-72 (For availability see N75-22504 14-31)

N75-22510 Hawker Siddeley Dynamics Ltd., Stevenage (England).
STRUCTURAL ANALYSIS OF THE SPACELAB PALLET
J. K. Bennet and P. V. Lathwell *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 73-79 (For availability see N75-22504 14-31)

N75-22511 Grumman Aerospace Corp., Bethpage, N.Y.
NASTRAN ANALYSIS OF THE 1/8 SCALE SPACE SHUTTLE DYNAMIC MODEL
M. Bernstein, P. W. Mason, J. Zalesak, D. Gregory, and A. Levy *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 81-128 refs (For availability see N75-22504 14-31)

N75-22513 Dornier-System G.m.b.H., Friedrichshafen (West Germany).
RELIABILITY OF SPACECRAFT STRUCTURES: RELIABILITY/SAFETY-FACTOR TRADE-OFF
K. Radimirsch *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 167-172 (For availability see N75-22504 14-31)

N75-22514 Lockheed Missiles and Space Co., Sunnyvale, Calif.
LOW-COST APPROACHES TO SPACELAB
R. M. Gray *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 173-189 refs (For availability see N75-22504 14-31)

N75-22515* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
A DISCUSSION OF SORTIE LAB STRUCTURAL SUBSYSTEM TRADE STUDIES
R. W. Schock *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 191-198 (For availability see N75-22504 14-31)

N75-22516 Boeing Co., Seattle, Wash.
APPLICATION OF AEROSPACE STRUCTURES TO LARGE MANNED SPACECRAFT
G. F. Riley and H. L. Schumann *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 199-219 (For availability see N75-22504 14-31)

N75-22517 Contraves Corp., Zurich (Switzerland).
DESIGN/ANALYSIS APPROACH FOR THE SPACELAB PALLET STRUCTURE
K. J. Zimmermann *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 221-252 (For availability see N75-22504 14-31)

N75-22518 Hawker Siddeley Dynamics Ltd., Stevenage (England).
THE DESIGN PHILOSOPHY OF A REUSABLE SPACE STRUCTURE
J. A. Dickinson *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 253-257 (For availability see N75-22504 14-31)

N75-22519 Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Stuttgart (West Germany). Inst. fuer Bauweisen- und Konstruktionsforschung.
MECHANICAL PROPERTIES OF COMPOSITE MATERIALS AND DESIGN CONCEPTS FOR COMPOSITE STRUCTURES
R. Kochendoerfer, G. Grueninger, and K. Stellbrink *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 259-281 refs (For availability see N75-22504 14-31)

N75-22520 Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany).
SOME ACTIVITIES CONCERNING THE APPLICATION OF COMPOSITE MATERIALS TO STRUCTURAL COMPONENTS OF SPACECRAFT
R. Zimmermann *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 283-291 refs (For availability see N75-22504 14-31)

N75-22521 Battelle Inst., Frankfurt am Main (West Germany).
FIBER-REINFORCED LIGHT METALS: RESULTS OF DEVELOPMENT WORK. FUTURE TRENDS AND COMPARISON WITH OTHER MATERIALS
J. Nixdorf and G. Weisser *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 293-311 refs (For availability see N75-22504 14-31)

N75-22522 Aeritalia, Turin (Italy).
MANUFACTURE OF LARGE MANNED AEROSPACE STRUCTURES
F. Livi and R. Vietto *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 315-340 (For availability see N75-22504 14-31)

N75-22523 Dornier-System G.m.b.H., Friedrichshafen (West Germany).
DIFFUSION BONDING FOR VACUUM-TIGHT STRUCTURES
H. Stockburger, E. vanRensen, and K. Gerber *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 341-348 (For availability see N75-22504 14-31)

N75-22524 McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
FRACTURE CONTROL OF WELDED PRESSURIZED STRUCTURES FOR MANNED SPACEFLIGHT
R. A. Rawe *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 349-260 refs (For availability see N75-22504 14-31)

N75-22525 Royal Netherlands Aircraft Factories Fokker, Amsterdam.
APPLICATION OF SANDWICH CONSTRUCTIONS IN MANNED SPACECRAFT
M. P. Nieuwenhuizen *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 361-372 refs (For availability see N75-22504 14-31)

N75-22526 Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).
THOUGHTS ON MATERIALS AND SERVICE LIFE FOR A REUSABLE SPACECRAFT
K. O. Sippel and D. Weisgerber *In* ESRO Large Struct. for

Manned Spacecraft Mar. 1974 p 373-383 refs (For availability see N75-22504 14-31)

N75-22532 Erno Raumfahrttechnik G.m.b.H., Bremen (West Germany).
PREDICTION OF HIGH-FREQUENCY VIBRO-ACOUSTIC ENVIRONMENT BY STATISTICAL ENERGY ANALYSIS
H. G. Maager *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 441-446 refs (For availability see N75-22504 14-31)

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography*.

N75-22370 Saskatchewan Univ., Saskatoon.
A MAXIMUM-INTENSITY SEEKER FOR UPPER ATMOSPHERE STUDIES Ph.D. Thesis
Garry Edward Paulson 1974 171 p
Avail: Univ. Microfilms Order No. 75-8299

Spin stabilized rockets with instrumented payloads are used to gather photometric data from the aurora borealis. A two-axis control system is developed to increase the probability of a successful experiment and to simplify the postflight data reduction. The concepts of a single-axis azimuth control system are extended to the development of a two-axis control system which is capable of positioning the field of view so that it is horizontal and coplanar with the axis of symmetry of the rocket and the maximum electromagnetic intensity vector as seen by the scanning assembly. The limitations of the two-axis control system are established and recommendations are made for a rocket-borne control system. Dissert. Abstr.

N75-22371# Panametrics, Inc., Waltham, Mass.
DESIGN, FABRICATION, AND INTEGRATION OF AN ELECTROSTATIC ANALYZER FOR A SATELLITE PAYLOAD Interim Report
Paul R. Morel, Rederick A. Hanser, and Bach Sellers Dec. 1974 31 p refs
(Contract F19628-73-C-0019; AF Proj. 7601)
(AD-A006698; SR-1; AFCRL-TR-75-0017) Avail: NTIS CSCL 04/1

A satellite-borne electron spectrum analyzer has been developed. This instrument performs a 32 channel differential analysis of 0.08 to 17 keV electrons, via electrostatic deflection. The described instrument is a modified version of units successfully launched into auroral breakups at Ft. Churchill, Manitoba, Canada. The modified design minimizes weight and power requirements, and provides an interface compatible with the S3 satellites. Two instruments have been fabricated, tested and calibrated. One has been integrated into the S3-2 satellite, scheduled for launch in 1975. The second instrument (a backup to the flight unit) is scheduled to be subjected to a long term vacuum test (3-6 months duration) at AFCRL. GRA

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels*, and *44 Energy Production and Conversion*.

N75-22372 Princeton Univ., N.J.
ANODE POWER IN THE QUASI-STEADY MPD THRUSTER Ph.D. Thesis
Aaron Jaan Saber 1974 146 p
Avail: Univ. Microfilms Order No. 75-6674

Local anode heat flux in a quasi-steady MPD thruster is measured by thermocouples attached to the inside surface of a shell anode. Over a range of arc currents J from 5.5 to 44 kiloamperes and argon propellant mass flows m from 1 to 48 g/sec, with the ratio j squared/m held constant, the fraction of arc power deposited in the anode is found to decrease with increasing arc power. Specifically, this anode power fraction decreases from 50% at 200 kW arc power, to 10% at 20 MW. In an effort to account for this functional behavior, the current density, plasma potential, and electron temperature in the plasma adjacent to the anode are measured with probes, and the results are used in a theoretical anode heat flux model. The model asserts that energy exchange between electrons and heavy particles in the plasma near the anode occurs over distances greater than the anode sheath thickness. Dissert. Abstr.

N75-22373*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
FRONTIERS IN PROPULSION RESEARCH: LASER, MATTER-ANTIMATTER, EXCITED HELIUM, ENERGY EXCHANGE THERMONUCLEAR FUSION
D. D. Papailiou, ed. 15 Mar. 1975 213 p refs
(Contract NAS7-100)
(NASA-CR-142707; JPL-TM-33-722) Avail: NTIS HC $7.25 CSCL 22B

Concepts are described that presently appear to have the potential for propulsion applications in the post-1990 era of space technology. The studies are still in progress, and only the current status of investigation is presented. The topics for possible propulsion application are lasers, nuclear fusion, matter-antimatter annihilation, electronically excited helium, energy exchange through the interaction of various fields, laser propagation, and thermonuclear fusion technology. Author

N75-22374# British Aircraft Corp. (Operating) Ltd., Bristol (England).
SOLID-BACKED THERMOPILES TECHNOLOGY DEVELOPMENT Final Report on Phase 2
E. M. N. Baldwin, L. Callard, M. Cole, and J. Dalgliesh Paris ESRO Nov. 1974 160 p refs
(Contract ESTEC-1392/71-TIAA)
(ESRO-CR-216) Avail: NTIS HC $6.25

Work carried out to produce solid-backed thermopiles for use in the earth-horizon detecting system onboard geostationary satellites is described. It includes methods employed to deposit the semiconductor thermoelectric alloys required, electrical and physical properties of these films, and their behavior in various simulated space environments, as well as design, manufacture, and testing methods of complete thermopiles. For individual titles, see N75-22375 through N75-22376.

N75-22375 British Aircraft Corp. (Operating) Ltd., Bristol (England).
THERMOELECTRIC MATERIAL DEPOSITION
In its Solid-Backed Thermopiles Technol. Develop. Nov. 1974 p 1-89 (For availability see N75-22374 14-20)

Methods employed to deposit the P-type and N-type semiconductor thermoelectric alloys required, the electrical and physical properties of these films, and their behavior in various simulated space environments are described. Thermocouples of P-type Bi2Te3/Sb2Te3 and N-type Bi2Te3/Sb2Te3 alloys give combined Seebeck coefficients of 360 micro V/C. The thermoelectric characteristics appear to be slightly affected by humidity. Various thermopiles were constructed, the highest responsivity being approximately 2.8 V/W at (14-16) microns. ESRO

N75-22376 British Aircraft Corp. (Operating) Ltd., Bristol (England).
THERMOPILE DESIGN, MANUFACTURE, AND TESTING
In its Solid-Backed Thermopiles Technol. Develop. Nov. 1974 p 91-150 (For availability see N75-22374 14-20)

The design, manufacture, and testing of solid-backed thermopiles to be used in earth horizon detecting system onboard geostationary satellites are described. Two basic configurations were used. The first was designed purely for testing purposes and consisted of one element of 178 junctions with a sensitive area of 0.27 sq cm. This gave responsivities (to 15 micrometer radiation) up to 7.5 V/W with time constants of 95 ms. The second configuration was based on the proposed design for the ATC satellite altitude sensing system using only two of the three

elements - the fine sensing and the earth radiance compensating elements. Responsivities (to 15 micrometer radiation) up to 8.3 V/W with time constants of 240 ms, both parameters measured under vacuum, were obtained. ESRO

N75-22377# Leeming (Harold) and Associates, Redlands, Calif.
DEVELOPMENT OF A THREE DIMENSIONAL STRESS GAGE FOR PROPELLANT GRAINS Final Report, Mar. 1972 - Nov. 1974
Harold Leeming Feb. 1975 381 p refs
(Contract F04611-72-C-0041)
(AD-A007047; R-71-102-F; AFRPL-TR-74-48) Avail: NTIS CSCL 21/9

The report reviews investigations into the design, manufacture, and test of multiaxial stress sensors for measuring the components of stress in a solid propellant grain. A 6-element 3D, triaxial sensor and a 3-element biaxial sensor were developed. Techniques for calibration are discussed, together with the problems of calibrating a 3D gage. The final phase of the program consisted of the manufacture of a solid grain, inert propellant STV containing a number of 3D and biaxial sensors, together with six diaphram normal sensors for comparison. The results of the STV tests under thermal, hydrostatic, and differential pressure tests are described. GRA

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N75-22378# Unilever Research, Vlaardingen (Netherlands).
INFRARED SPECTRA OF CHEMISORBED MOLECULES. PART 4: HYDROGENATION OF SOME SMALL ALKENES ON SILICA-SUPPORTED NICKEL
J. Erkelens [1975] 20 p refs Revised Submitted for publication
Avail: NTIS HC $3.25

The IR spectra of ethene, propene, 1-butene, and butadiene were monitored during hydrogenation on a silica-supported nickel catalyst using the flow-circulation method. A special cell was constructed for compensation of the spectrum of the gas phase. In the case of ethylene, a band at 3012 cm1 was assigned to the NiCH=CHNi species. Other bands indicated the presence of surface groups containing saturated carbon atoms while polymerized material remained on the surface when the ethene flow was stopped. The spectra of propene and 1-butene mainly consist of one intensive band at about 2950 cm1, indicating chemisorbed secondary propyl and butyl groups, respectively. In case of butadiene, a methylene-rich species dominated, which remained on the surface when the butadiene flow was stopped, thus obscuring the absorption bands of the reactive species present during the catalytic hyrogenation. Author (ESRO)

N75-22379# Unilever Research, Vlaardingen (Netherlands).
THE DETERMINATION OF PROSTAGLANDIN METABOLITES IN HUMAN URINE
Diederik H. Nugteren [1975] 23 p refs Revised Submitted for publication
Avail: NTIS HC $3.25

A method was developed by which the human urinary prostaglandin metabolites are converted into stable prostanoic and prostanedioic acid homologs. The urine is reduced with sodium borohydride, and the organic compounds, isolated with an Amberlite XAD-2 column, are treated with fuming hydrogen iodide, followed by treatment with zinc in methanolic hydrogen chloride, to yield dimethyl tetranor-prostanedioate as the major product of human prostaglandin metabolism. This compound is determined by gas chromatography, after a single purification by thin layer chromatography. The excretion of total tetranorprostanedioic acid derivatives in healthy subjects was found to be 0.21 + or - 0.08 mg per g creatinine or 0.3 + or - 0.1 mg per 24 h. Author (ESRO)

N75-22380# Unilever Research, Vlaardingen (Netherlands).
ARACHIDONATE LIPOXYGENASE IN BLOOD PLATELATS
D. H. Nugteren [1975] 18 p refs Submitted for publication
Avail: NTIS HC $3.25

Blood platelets contain a lipoxygenase which converts licosapolyenoic acids with at least two double bonds at the 8- and 11-position into L-12-hydroperoxy acids. The characterization of the enzyme responsible, isolated from the supernatant of broken platelets, and the identification of the reaction products are described. ESRO

N75-22381# EIC, Inc., Newton, Mass.
SOME OBSERVATIONS ON THE ATTACK OF ESTERS BY LITHIUM Final Technical Report, 1 Jan. 1974 - 31 Jan. 1975
R. David Rauh Feb. 1975 9 p refs
(Contract N00014-74-C-0205; ARPA Order 2611; NR Proj. 359-571)
(AD-A006746; C-404-3) Avail: NTIS CSCL 07/3

Deposition and discharge of lithium on an inert (nickel) substrate was studied in an electrolyte composed of 1M LiClO4 in methyl pivalate. As with methyl acetate, cycling efficiencies were less than 10%, and the corrosion rate was greater than 200 microamps/sq cm. In methyl pivalate, the corrosion rate of the electrodeposited metal was relatively unaffected by SO2 or nitromethane, unlike methyl acetate. The similar behavior of the two pure esters implies a corrosion mechanism involving initial electron transfer to the carbonyl carbon rather than alpha hydrogen abstraction. GRA

N75-22382# Wisconsin Univ., Madison. Mathematics Research Center.
MODELLING THE LONG RANGE DEVELOPMENT OF THE INTERMEDIATE CHEMICALS INDUSTRY
Dale F. Rudd Oct. 1974 74 p refs
(Contract DA-31-124-ARO(D)-462)
(AD-A001661/8; MRC-TSR-1471) Avail: NTIS CSCL 07A

The report discusses modelling of the intermediate chemicals industry. Economics, chemistry, engineering, and marketing are discussed in relation to each other in considering projections of industrial development. GRA

24 COMPOSITE MATERIALS

Includes laminates.

N75-22383 Drexel Univ., Philadelphia, Pa.
THEORETICAL AND EXPERIMENTAL STUDIES ON THE CREEP BEHAVIOR OF A GRAPHITE-EPOXY COMPOSITE MATERIAL Ph.D. Thesis
Seyed Ahmad Ahmadi Altoulami 1975 220 p
Avail: Univ. Microfilms Order No. 75-6122

The thermal-mechanical behavior of a graphite fiber reinforced epoxy composite material is studied experimentally by a series of uniaxial static and creep tests in thermally controlled environment. The experimental results of the epoxy material are used to quantitize an analytical viscoelastic model assuming a linear, rheologically simple material. The viscoelastic model for the unidirectional composite material is eventually incorporated into a laminated plate theory. This latter theory is applied to predict the time-temperature creep behavior of angle-ply laminates in controlled temperature environments. These predicted results are finally compared with the experimental data. Dissert. Abstr.

N75-22384*# Babcock and Wilcox Co., Augusta, Ga. Refractories Div.
DEVELOPMENT PROGRAM TO PRODUCE MULLITE FIBER INSULATION
W. G. Long Apr. 1975 39 p refs
(Contract NAS3-16782)
(NASA-CR-134805) Avail: NTIS HC $3.75 CSCL 11D

Processing methods were utilized to form a mullite fiber-Kaowool felt. The formation of a blended felt using the Rotoformer wet-laying method was successful. Felt products were evaluated for tensile strength, thermal stability, thermal conductivity and structural integrity at 1259 C and 1371 C. Textile processing methods failed in an attempt to form a yarn from staple and multifilament mullite fiber due to fiber damage through mechanical

handling. The refractoriness of pure Kaowool ceramic fiber is improved with additions of 30% or greater mullite fiber. Author

N75-22385*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
INTERACTION OF GRAPHITE AND ABLATIVE MATERIALS WITH CO2-LASER, CARBON-ARC, AND XENON-ARC RADIATION M.S. Thesis - George Washington Univ., Washington, D. C.
William Dennis Brewer May 1975 81 p refs
(NASA-TM-X-68726) Avail: NTIS HC $4.75 CSCL 11D

The behavior of graphite and several charring ablators in a variety of high radiative heat flux environments was studied in various radiative environments produced by a CO2 laser and a carbon arc facility. Graphite was also tested in xenon arc radiation. Tests were conducted in air nitrogen, helium, and a mixture of CO2 and nitrogen, simulating the Venus atmosphere. The experimental results are compared with theoretical results obtained with a one dimensional charring ablator analysis and a two dimensional subliming ablator analysis. Photomicroscopy showed no significant differences in appearance or microstructure of the charring ablators or graphite after testing in the three different facilities, indicating that the materials respond fundamentally the same to the radiation of different frequencies. The performance of phenolic nylon and graphite was satisfactorily predicted with existing analyses and published material property data. Author

N75-22386*# Kanner (Leo) Associates, Redwood City, Calif.
INVESTIGATION OF THE STRESS-STRAIN STATE OF COMPOSITE MATERIALS WITH A GRID REINFORCEMENT
L. N. Moguchiy and G. G. Leshkevich Washington NASA Apr. 1975 10 p refs Transl. into ENGLISH from the book "Obrabotka Davleniyem i Mekhanicheskiye Svoystva Tugoplavkikh Metallov i Splavov" Moscow, Nauka Press, 1974 p 35-39 Sponsored by NASA
(NASA-TT-F-16274) Avail: NTIS HC $3.25 CSCL 11D

The distribution of stresses between the components of a composite (grid fibers and matrices) is studied along with the effect of orientation on the contribution of grid fibers to the strength of the composite. It is shown that the orientation of the grid fibers affects strength, the direction of the external load, and the mechanisms of deformation and rupture of composites. Results are presented and discussed. J.M.S.

N75-22387# Hawker Siddeley Dynamics Ltd., Hatfield (England).
THE USE OF CARBON FIBRE REINFORCED PLASTICS IN SATELLITE STRUCTURES. VOLUME 2: TECHNICAL APPENDICES A TO D Final Report on Phase 2, Oct. 1973 - Dec. 1974
Dec. 1974 244 p refs 2 Vol.
(Contract ESTEC-1735/72-PP)
(HSD-TP-7509-Vol-2-App-A-D; ESRO-CR(P)-598) Avail: NTIS HC $7.50

Four work package reports are presented covering the following: CFRP (Carbon Fiber Reinforced Plastics) joints for use in satellite structures; effects of thermal cycling and shock on the mechanical properties of CFRP laminates; mechanical and thermal properties of CFRP as a function of temperature, and the design, manufacture and test of an IME boom. For individual titles, see N75-22388 through N75-22391.

N75-22388 Hawker Siddeley Dynamics Ltd., Hatfield (England).
JOINTS WORK PACKAGE REPORT
J. G. Lewis *In its* The Use of Carbon Fibre Reinforced Plastics in Satellite Structures Dec. 1974 51 p (For availability see N75-22387 14-24)
Copyright.

To gain experience and to obtain comparisons between predictions and failure test data, types of joints found in satellite structures were manufactured for test purposes from Carbon Fiber Reinforced Plastics (CFRP). The results obtained were very encouraging when compared with the established aluminum alloy joints but showed that the potential of the high strength and modulus could not be used to the full advantage for some applications. Careful attention must be made during the design to gain the full advantage of CFRP. Author (ESRO)

N75-22389 United Kingdom Atomic Energy Authority, Harwell (England).
THE EFFECTS OF THERMAL CYCLING AND SHOCK ON THE MECHANICAL PROPERTIES OF CFRP LAMINATES. WORK PACKAGE REPORT
N. L. Hancox and D. C. C. Minty *In* Hawker Siddeley Dyn. The Use of Carbon Fibre Reinforced Plastics in Satellite Structures Dec. 1974 25 p refs (For availability see N75-22387 14-24)
Copyright.

The effects of thermal cycling and shock, between temperatures of -196 C and +100 C, on the flexural and interlaminar shear properties of carbon fiber composites were studied. Longitudinal, transverse and balance 0 deg/90 deg cross ply specimens made from HM-S and HT-S fiber and space approved Shell and CIBA epoxy resins were used. Either environment may cause an initial rise in a given mechanical property and then a decrease to the original, zero cycle, value. Overall for 100 shocks, or 500 cycles, there is no deterioration of a well-made laminate. The initial property increase is believed to be due to the release of stresses built into the fibers when the specimens were molded and not relieved in the final cure of the composite. Author (ESRO)

N75-22390 United Kingdom Atomic Energy Authority, Harwell (England).
MECHANICAL AND THERMAL PROPERTIES OF CFRP AS A FUNCTION OF TEMPERATURE. WORK PACKAGE REPORT
N. L. Hancox, D. C. C. Minty, D. J. Baker, R. D. A. Hall, M. J. Mortimer, and D. L. McElroy *In* Hawker Siddeley Dyn. The Use of Carbon Fibre Reinforced Plastics in Satellite Structures Dec. 1974 23 p refs (For availability see N75-22387 14-24)
Copyright.

Measurements of simple mechanical strength and stiffness properties, and coefficients of thermal expansion and conductivity for temperatures between -196 C and about 100 C, are reported. Mechanical properties other than modulus, tend to fall with decreasing temperature and show much greater scatter. Thermal conductivity increases with temperature and is greater in the fiber direction and for HM-S fiber composites as expected. Longitudinal composites have a small, in some cases negative, coefficient of thermal expansion over the entire temperature range considered here. The coefficient of expansion for transverse and cross-ply specimens increases with temperature especially for the former type of specimen. Author (ESRO)

N75-22391 Hawker Siddeley Dynamics Ltd., Hatfield (England).
DESIGN, MANUFACTURE AND TEST OF AN IME BOOM. WORK PACKAGE REPORT
M. Ricket *In its* The Use of Carbon Fibre Reinforced Plastics in Satellite Structures Dec. 1974 143 p refs (For availability see N75-22387 14-24)
Copyright.

The design, manufacture and test of a CFRP (Carbon Fiber Reinforced Plastics) spacecraft boom is reported. Representative sections based on design parameters were initially manufactured and tested to provide feedback information for the final system. Aluminum fittings were utilized for cost reasons and included an electron beam welded elbow joint. Boom parameters were determined including stiffness, natural frequencies and strains during deployment. Torsional properties were found to be high but longitudinal properties were rather low which resulted in a lowest natural frequency of 20Hz compared with a design requirement of 25Hz. Deployment testing exemplified overall boom performance. Author (ESRO)

N75-22392# Sandia Labs., Albuquerque, N.Mex.
EFFECT OF RESIN PROPERTIES ON THE TRANSVERSE MECHANICAL BEHAVIOR OF HIGH PERFORMANCE COMPOSITES
R. E. Allred and F. P. Gerstle, Jr. 1974 23 p refs
(SAND-74-5823; Conf-750201-1) Avail: NTIS HC $3.25

The transverse mechanical properties of several high-performance composites were determined by axial tension tests on circumferentially wound thin-walled cylinders. Thornel 400, Thornel 75S, and Kevlar filaments were combined with ERLA 4617, ERL 0510, and DER 332 epoxide resins to provide a wide range of constituent stiffnesses and strengths. Results

indicate that composite transverse stiffness is three times more sensitive to changes in resin stiffness than to changes in filament transverse stiffness. Micromechanics theories for predicting transverse modulus were compared. The excellent agreement shown by the theories of Halpin-Tsai and Greszczuk obviates more rigorous analyses for describing this class of materials. It was concluded that the thin-walled specimen used to determine transverse stiffness was inadequate for characterization of transverse strength. Author (NSA)

N75-22393# Southwest Research Inst., San Antonio, Tex.
A STUDY OF THE STRESS-STRAIN BEHAVIOR OF GRAPHITE FIBER COMPOSITES TO ASSESS THE STRESS LEVELS AT WHICH SIGNIFICANT DAMAGE OCCURS Final Report, Jul. 1971 - Jul. 1973
Glenn C. Grimes, Phillip H. Francis, George E. Commerford, and George K. Wolfe Jan. 1974 130 p refs
(Contract F33615-71-C-1574; AF Proj. 7340)
(AD-A007069; AFML-TR-73-311) Avail: NTIS CSCL 11/4

The purpose of this investigation was to attempt to obtain by experimental means a rigorous definition of the stress level within a composite specimen at which physical damage and/or degradation of mechanical properties was initiated. The goal of the study was to show that the composite material resistance to subsequent loadings is seriously impaired. This purpose and goal are similar to the ones pursued on a cursory basis in a previous report by the authors. In continuing the study on the HTS/ERL-2256 graphite epoxy in (0)C, (0/90)C, (0/ plus or minus 45/0)C, (90/ plus or minus 45/0)C, and (plus or minus 45)C orientations, the axially loaded flat specimen, tube test, and characterization program was continued. In this program, load-introduction problems on tubes were studied along with compression test methods. Additional fatigue data were generated, showing good correlation with significant damage (proportional limit) stress levels. Maximum strain criterion was used to predict the proportional limit (significant damage level) and cultivate strength with considerable success. A large number of tubes was fabricated for testing in the balance of the program and a test plan worked out. GRA

N75-22394# Aerospace Corp., El Segundo, Calif.
HANDBOOK OF TEST METHODS FOR EVALUATION AND QUALIFICATION OF ALUMINUM-GRAPHITE COMPOSITE MATERIALS Interim Report
F. Padilla, W. C. Harrigan, Jr., and M. F. Amateau 21 Feb. 1975 72 p refs
(Contract F04701-74-C-0075)
(AD-A007057; TR-0075(5621)-3; SAMSO-TR-75-54) Avail: NTIS CSCL 11/4

Aluminum-graphite composites are produced through molten infiltration of aluminum into continuous tows of graphite fibers. The process produces a continuous rod of composite that is subsequently fabricated into larger structures. The testing and evaluation of this system requires the use of unique testing techniques. The report explains in detail the testing techniques developed for this composite system. GRA

N75-22395# University Coll. of North Wales, Bangor. School of Physical and Molecular Sciences.
PREPARATION AND PROPERTIES OF A STABLE METALLIC FERROFLUID Final Technical Report, 1 Oct. 1973 - 30 Sep. 1974
P. L. Windle, J. Popplewall, and S. W. Charles Sep. 1974 43 p
(Contract DAJA37-73-C-2929; DA Proj. 200-61102-B-32D)
(AD-A007217) Avail: NTIS CSCL 11/7

This work attempts to determine a technique for stabilizing a dispersion of small iron particles in mercury (i.e. a ferrofluid). The results relate to the production of the ferrofluids and to the stability of these ferrofluids with and without a tin additive, during aging at 425K. Agglomeration due to magnetic interactions can be reduced at room temperature by producing a ferrofluid containing particles of approximately 12A radius. Two ferrofluids (1.5 emu/gm and 4.25 emu/gm) are produced by electrodeposition of iron onto a mercury cathode. Agitation of the iron particles by a 700 Oe a.c. inhomogeneous magnetic field is used to prevent agglomeration and help disperse the particles into the mercury. Growth kinetics for iron in mercury are compared with experimental results. Two possible mechanisms for the greater stability of the tin-present ferrofluids are discussed. GRA

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics.*

N75-22396 Montana State Univ., Missoula.
DEVELOPMENT OF TECHNIQUES FOR NON FLAME SPECTROSCOPIC DETERMINATION OF TRACE METALS Ph.D. Thesis
Darryl Duane Siemer 1974 106 p
Avail: Univ. Microfilms Order No. 75-5326

A mercury analysis system is presented which is adaptable to the determination of mercury in any type of sample. Mercury vapor in air or other gases is captured by filtration through gold plated, porous graphite carbon rod atomizer tubes. Mercury in solid samples is converted to the metal vapor by burning the sample in pure oxygen. Mercury in aqueous samples is reduced to the vapor with stannous chloride. The gold plated porous tubes are placed between the rods of a carbon rod atomizer and the mercury atomized and measured with an atomic absorption spectrometer. Substances which normally interfere in the atomic absorption determination of mercury pass through the walls of the porous graphite tubes and are not a problem. Operating parameters and some applications are discussed. Detection limits in the ppm to ppb level with relative standard deviations of 4% to 10% range are achieved. Dissert. Abstr.

N75-22397 Missouri Univ., Columbia.
LANTHANUM COBALTITE AS FUEL CELL ELECTRODE: EFFECT OF DOPING CONTENTS ON THE ACTIVITY FOR OXYGEN REDUCTION IN AQUEOUS KOH Ph.D. Thesis
Robert Nin Kung Lo 1974 126 p
Avail: Univ. Microfilms Order No. 75-5760

A series of lanthanum cobalt oxides LA(1-x) YxCoO3, where Y is Sr, Th, or Ba, have been examined for their catalytic activities as fuel cell cathode materials for the oxygen reduction reaction in 5 N potassium hydroxide solution at room temperature. Direct steady state potentiostatic method has been used to obtain the voltage current curves. Strontium doped oxides (p-type) are found to be more active than both thorium doped (n-type) and barium doped (p-type) oxides; while pure lanthanum cobalt oxide is inactive. The rate of reaction as reflected by the current density increases as the amount of dopants introduced increases until it reaches a maximum. Dissert. Abstr.

N75-22398 Princeton Univ., N.J.
ELECTRONIC PROPERTIES AND THE THERMAL AND PHOTO DECOMPOSITION OF POTASSIUM AZIDE Ph.D. Thesis
Arnaud DePanafieu 1974 164 p
Avail: Univ. Microfilms Order No. 75-6700

The role of charge carriers (electrons, holes, ions) in the thermal and photo decomposition of potassium azide is experimentally studied in an ultrahigh vacuum system where very small decomposition rates can be measured and where contamination of the sample surface is neglible. The thermal decomposition of KN3 is found to be temperature activated with activation energies of 1.0 + or - 0.1 eV, 135 + pr - 0.1 eV, and 2.4 + or - 0.2 eV which compare well to the activation energies for ionic conductivity. Results show that (1) the thermal decomposition of KN3 involves a surface reaction consecutive to the arrival of ions, by diffusion, at the sample surface; and (2) the first step of the surface reaction is an electron transfer from N3(-) to small potassium islands, followed by nitrogen evolution and potassium evaporation. Photo decomposition of KN3 is found to result from the arrival of holes at the surface of material, decomposition being enhanced when more holes drift to the surface. A model for photolysis is presented in which an electron

is first excited and then transferred to a potassium colloid. In this model, the colloids grow by K+ ions diffusion and nitrogen evolution is consecutive to the capture of holes by surface azide ions. Dissert. Abstr.

N75-22399 Florida State Univ., Tallahassee.
STUDIES OF COLLISIONAL EXCITATION TRANSFER PROCESSES IN HELIUM Ph.D. Thesis
Paul Harris Wine 1974 197 p
Avail: Univ. Microfilms Order No. 75-8061

Electron impact excitation was employed to study the pressure variation of steady state luminescence from 27 levels of helium. Apparent cross sections have been determined for these levels over a broad pressure range of .025 to .91 torr. A series of model calculations were performed to fit experimental data to a set of steady state equations, taking into account the various mechanisms by which an excited state can be populated and depopulated. Examination of two levels not directly involved in collisional excitation transfer processes made it possible to distinguish the effects of collisional excitation transfer from those of secondary electron excitation. Dissert. Abstr.

N75-22400 Cornell Univ., Ithaca, N.Y.
THE BINDING ENERGY OF CARBON ON Ni(100) AND A STEPPED NICKEL SURFACE FROM EQUILIBRIUM SEGREGATION STUDIES Ph.D. Thesis
Lawrence Clair Isett 1975 228 p
Avail: Univ. Microfilms Order No. 75-8599

The equilibrium segregation of carbon to Ni(100) was studied in detail using low energy electron diffraction and Auger electron spectroscopy (AES) to determine the energetics of the system and the surface structures formed. Experiments were performed in UHV with temperatures from 600 K to 1200 K achieved by direct current heating of ribbon crystals, the temperature being regulated to 0.2 K. Carbon surface concentrations were monitored by AES and carbon bulk dopings were obtained from chemical analysis and in situ observations of precipitation temperature. The heat of segregation of carbon to Ni(100) was determined from isosteres constructed from data from crystals having bulk dopings of 1300, 1050, 850, 600, and and 45/wppm carbon to be -10.8 kcal/mole + or - 1.8 kcal/mole. The bond-energy-bond order empirical theory of binding was used to predict binding energies of carbon atoms on nickel surfaces. Dissert. Abstr.

N75-22401 Catholic Univ. of America, Washington, D.C.
AN INVESTIGATION OF VISCOELASTIC LIQUIDS EMPLOYING OPTICAL DIGITAL-CORRELATION SPECTROSCOPY Ph.D. Thesis
Peter William Drake 1975 187 p
Avail: Univ. Microfilms Order No. 75-10753

The capabilities of optical spectroscopy by fast digital autocorrelation of photon-counting fluctuations were explored as an aid in investigating viscoelastic phenomena in the long-relaxation time range. The three viscoelastic systems studied were butanediol 1,3, dimethylesulfoxide (DMSO) in water, and the lubricant 5P4E (a polyphenyl ether). The Butanediol 1,3 results support the developed relationship between the isothermal longitudinal retardational time measured by the correlator experiment and the adiabatic longitudinal relaxation times measured by ultrasonics. It was shown that the correlator technique in the DMSO under system can be effectively employed to measure and separate multiple relaxation processes. Propagating transverse Brillouin peaks were observed in 5P4E and the reported pressure data correlated to investigate the pressure dependence of the structural relaxation process. Dissert. Abstr.

N75-22402*# Scientific Translation Service, Santa Barbara, Calif.
DETERMINATION OF GROUP COMPOSITION OF PETROLEUM FRACTIONS IN A LIQUID CHROMATOGRAPH
T. S. Ivanova, Yu. A. Burkin, and V. G. Zizin Washington NASA May 1975 6 p ref Transl. into ENGLISH from Neftepererab. i Neftekhimiia (Moscow), no. 2, 1971 p 32-54
(Contract NASw-2483)
(NASA-TT-F-16289) Avail: NTIS HC $3.25 CSCL 07D

A new prototype model of a liquid chromatograph with automatic recording of analysis results, built at the Bashkir Scientific Research Institute of the Petroleum Industry, is described. Author

N75-22403*# Scientific Translation Service, Santa Barbara, Calif.
ANALYTICAL TECHNIQUES USING X-RAY FLUORESCENCE SPECTROMETRY
L. DeLindemann Washington NASA May 1975 18 p refs Transl. into ENGLISH from Riv. Combust. (Italy), v. 25, 1971 p 299-304
(Contract NASw-2483)
(NASA-TT-F-16287) Avail: NTIS HC $3.25 CSCL 07D

Some examples are given of how X-ray fluorescence spectrometry can be used in practical analysis of crude oil. Details are submitted on qualitative analysis; quantitative analysis by the internal standard method; and on indirect quantitative analysis. Author

N75-22404*# Kanner (Leo) Associates, Redwood City, Calif.
ANALYSIS OF MINERAL OIL BY SOLID-LIQUID ELUTION CHROMATOGRAPHY
D. Stejaru, R. Popescu, and N. Mosescu Washington NASA May 1975 11 p refs Transl. into ENGLISH from Rev. Chim. (Bucharest), v. 20, 1969 p 756-767
(NASA-TT-F-16273) Avail: NTIS HC $3.25 CSCL 07D

A good separation of mono-, di-, tri-, and tetracyclic aromatic hydrocarbons was achieved by the method of adsorption chromatography on neutral alumina. The advantage of the method is considered to be that saturated hydrocarbons and resins are separated in a single operation. The UV-monitoring of the eluted fractions showed that there was practically no mutual contamination of the hydrocarbon fractions. Author

N75-22405*# Kanner (Leo) Associates, Redwood City, Calif.
REACTIONS OF CARBON DIOXIDE WITH SILICATES UNDER HIGH PRESSURES
Woldemar Weyl Washington NASA Apr. 1975 51 p refs Transl. into ENGLISH from Glastech. Ber. (Frankfurt am Main), v. 9, no. 12, Dec. 1931
(Contract NASw-2481)
(NASA-TT-F-16271) Avail: NTIS HC $4.25 CSCL 07D

Reactions of carbon dioxide with molten glass under high pressures were studied. Two special types of apparatus were employed. The results supported the existence of equilibria between silicates and carbonates. No evidence was found for the existence of eutectics or stoichiometric compounds. Analogous findings were obtained for calcium and lithium glasses. Author

N75-22406*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
HIGH TEMPERATURE CHEMICAL KINETIC STUDY OF THE H2-CO-CO2-NO REACTION SYSTEM
Casimir J. Jachimowski Washington May 1975 18 p refs (NASA-TN-D-7897; L-9994) Avail: NTIS HC $3.25 CSCL 07D

An experimental study of the kinetics of the H2-CO-CO2-NO reaction system was made behind incident shock waves at temperatures of 2460 and 2950 K. The overall rate of the reaction was measured by monitoring radiation from the CO + O yields CO2 + h upoilon reaction. Correlation of these data with a detailed reaction mechanism showed that the high-temperature rate of the reaction N + OH yields NO + H can be described by the low-temperature (320 K) rate coefficient. Catalytic dissociation of molecular hydrogen was an important reaction under the tests conditions. Author

N75-22407*# National Aeronautics and Space Administration, Washington, D.C.
THERMODYNAMIC AND RELATED PROPERTIES OF PARAHYDROGEN FROM THE TRIPLE POINT TO 300 K AT PRESSURES TO 1000 BAR Final Report
L. A. Weber 1975 105 p refs Prepared by NBS, Boulder (NASA Order C-32369-C)
(NASA-SP-3088; NBSIR-74-374) Avail: NTIS HC $5.25 CSCL 07D

Compressibility measurements and thermodynamic properties data for parahydrogen were extended to higher temperatures and pressures. Results of an experimental program are presented in the form of new pressure, volume and temperature data in the temperature range 23 to 300 K at pressures up to 800 bar. Also given are tables of thermodynamic properties on isobars to 1000 bar including density, internal energy, enthalpy, entropy,

specific heats at constant volume and constant pressure, velocity of sound, and surface derivatives. The accuracy of the data is discussed and comparisons are made with previous data.
Author

N75-22408# Dow Chemical Co., Golden, Colo. Rocky Flats Div.
HISTORY, USES, OCCURRENCES, ANALYTICAL CHEMISTRY, AND BIOCHEMISTRY OF BERYLLIUM. A REVIEW
J. A. Hurlbut 16 Dec. 1974 26 p refs
(Contract AT(29-1)-1106)
(RFP-2152) Avail: NTIS HC $3.75

A literature search in Chemical Abstracts dated 1947 through July 1973 concerning beryllium and beryllium oxide was performed in an attempt to uncover a beryllium exposure bioassay. The history, use, occurrence, analytical chemistry, and biochemistry of beryllium are summarized. Ashing, separation, gravimetric, volumetric, spectrophotometric, fluorometric, emission, activation, gas chromatographic, atomic absorption, polarographic, and miscellaneous techniques are discussed along with beryllium disease, mechanism of beryllium action, and indices of exposure. Author (NSA)

N75-22409# Los Alamos Scientific Lab., N.Mex.
INFLUENCE OF METALS ON THE THERMAL DECOMPOSITION OF S-TRIAMINO TRINITRO BENZENE (TATB)
E. D. Loughran, E. M. Wewerka, R. N. Rogers, and J. K. Berlin 1974 5 p refs Presented at the Conf. on Compatibility of Energetic Mater. with Plastics and Additives, Dover, N. J. 3 Dec. 1974 Sponsored by ERDA
(LA-UR-74-1737; Conf-741204-3) Avail: NTIS HC $3.25

Results of various experiments in which attempts were made to evaluate the magnitude of the effects and elucidate the mechanism of the thermal degradation of s-triamino trinitro benzene in the pure state and in the presence of copper, iron, brass, and aluminum are presented. It is shown that the rate of gas evolution at elevated temperatures increases markedly in the presence of copper, iron, or brass. Little or no effect is produced on the gas evolution rate by aluminum. Author (NSA)

N75-22410# Harvard Univ., Cambridge, Mass. Div. of Engineering and Applied Physics.
RELAXATION EFFECTS IN GLASSY SELENIUM
R. B. Stephens Feb. 1975 17 p refs
(Contract N00014-67-A-0298-0036; NR Proj. 032-544)
(AD-A006977; TR-3) Avail: NTIS CSCL 07/4

Thermal relaxation phenomena were measured in samples of both melt-quenched and evaporated selenium. On the basis of earlier studies, the two methods of preparation produced samples with polymeric chain concentrations of 30-50% and 0% respectively; the rest of the material was in the form of 8 member rings. The relaxation peak occurred between 320 and 330K, and had an activation energy of approximately 22.5 kcal/mole for the melt-quenched sample. A decrease of 1K in the glass relaxation temperature and 0.5 kcal/(gm atom) in the activation energy was observed in samples which had been initially evaporated. No change was observed as a result of melting and quenching these evaporated samples. Two consequences of this postulate are that the selenium analogue to the sulfur polymerization transition must occur well below room temperature if it exists, and therefore, that the equilibrium ring chain ratio can be smoothly extrapolated down to room temperature from the published high temperature data. GRA

N75-22411# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
PURIFICATION OF GASEOUS DISCHARGES OF RADIOACTIVE AEROSOLS AND GASES
S. Przyborowski 18 Feb. 1975 10 p Transl. into ENGLISH from Staatliche Zentrale fuer Strahlenschutz (Berlin), SZS-142, Sep. 1972 p 15-19
(AD-A006694; FTD-HC-23-0750-75) Avail: NTIS CSCL 07/1

The importance of a thorough testing of filter material used for the removal of aerosols from the exhaust air of nuclear power plants is noted. A method is presented for the assessment of penetration depending on particle size and flow rate. The results obtained are discussed. GRA

N75-22412# Illinois Univ., Urbana. Coordinated Science Lab.
STUDIES ON ACTIVATED CHEMISORPTION
Charles N. Stewart and Gert Ehrlich Oct. 1974 77 p refs
(Contract DAAB07-72-C-0259; Grant AF-AFOSR-2210-72)
(AD-A006785; R-672; UILU-ENG-75-2206) Avail: NTIS CSCL 07/4

Chemisorption of methane has been examined on highly perfect rhodium surfaces by a combination of field emission and molecular beam techniques in order to explore the mechanism of activation. It has been found that dissociative adsorption can be initiated on rhodium at 245 K just by excitation of the gas. Quantitative rate studies as a function of gas temperature have established that the CH4 molecule must overcome an activation barrier of 7 kcal/mole for reaction to occur. Evidence suggests that translational and rotational motion are not directly involved in passing over the barrier. Vibrational excitation of methane molecules appears to be the significant step in the reaction at the surface. Slater's dynamical model of unimolecular reactions leads to a sizable isotope effect for the rate of dissociation, and the semi-quantitative data presently available are best explained by his model. GRA

N75-22413# Illinois Univ., Urbana. Coordinated Science Lab.
ELECTRON SCATTERING STUDY OF CLEAN (100) TUNGSTEN AND ITS INTERACTION WITH OXYGEN AT LOW COVERAGE
Paul Ernest Luscher Jan. 1975 283 p refs
(Contract DAAB07-72-C-0259)
(AD-A006786; R-670; UILU-ENG-75-2203) Avail: NTIS CSCL 07/4

A unique and versatile electrostatic spectrometer has been designed and constructed to perform, on a single specimen in a single ultrahigh vacuum chamber, the following measurements: low energy electron diffraction, energy loss spectroscopy, Auger spectroscopy, electron stimulated desorption of ions, flash desorption, and incremental work function measurements. It is capable of operating over a wide range of incident electron beam energies (4 eV-(E sub p)-1800 eV) and spectral energies (0 eV-E 1000 eV), and it provides charge/mass identification of desorbed ions through time-of-flight measurements. This spectrometer has been applied to a study of the clean (100) surface of single crystal tungsten and its interaction with oxygen at submonolayer coverages. Emphasis was placed on developing an understanding of the energy loss mechanisms in tungsten in order to obtain information on the electronic structure of the substrate and adsorbate. GRA

N75-22414# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SORPTION OF INTERMEDIATE REACTION PRODUCTS IN THE ELECTROOXIDATION OF HYDRAZINE ON PLATINUM BLACK
G. A. Kalinouskaya 15 Jul. 1974 9 p refs Transl. into ENGLISH from Tr. Energ. Inst. (Moscow), no. 112, 1972 p 40-46
(AD-A006793; FSTC-HT-23-763-74) Avail: NTIS CSCL 07/4

Potentiostatic and potentiodynamic studies were made of electrical oxidation of hydrazine on platinized electrodes. Test data curves and discussion are presented. It is proposed that oxidation of adsorbed and chemisorbed radicals leads to sorption of other, different particles, such as nitrogen, which effectively poisons the electrode surface. The limits of existence of the intermediate radicals are 0.4-0.75 V applied potentials. GRA

N75-22415# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
CALCULATION OF EXCITED NITROGEN ION AND MOLECULAR RESONANT SCATTERING CROSS SECTIONS
O. K. Kostko and E. A. Chayanova 23 Jan. 1975 16 p refs Transl. into ENGLISH from Uch. Zap. Tsentr. Aerogidrodinamicheskii Inst. (USSR), no. 99, 1971 p 81-89
(AD-A006727; FTD-HC-23-1573-74) Avail: NTIS CSCL 07/4

The phenomenon of resonant scattering in the atmosphere during light propagation at wavelengths of 10,600, 9180 and 3914 A has been used in a number of works. In this article the authors calculate the effective cross sections for the following resonant scattering reactions: N2 (A cube Sigma sub u (+)) + h nu sub 1 reversible reaction N2 (B cube Pi sub g), and N2

(X square Sigma sub g (+)) + h nu sub 2 reversible reaction N2 (+) (A cube Pi sub g). Author

N75-22416# Army Electronics Command, Fort Monmouth, N.J.
CATHODIC REDUCTION OF CARBON-FLUORINE AND CARBON-NITROGEN-FLUORINE COMPOUNDS IN ORGANIC ELECTROLYTES
Herbert F. Hunger and Joseph E. Ellison Mar. 1975 27 p refs
(DA Proj. 1T1-61102-A-34A)
(AD-A007108; ECOM-4296) Avail: NTIS CSCL 07/4

The current-potential curves of polycarbon monofluoride (CF) cathodes in lithium/organic electrolyte/CF cells were measured using a technique which excluded the Ohmic iR drop. Further, the initial cathodic discharge behavior of perfluorinated organic compounds and fluorinated nitrogen containing organic compounds was compared with CF. Application of the mixed potential theory to the cathodic kinetic of polycarbon monofluoride led to a relationship between rate capability and electrochemical stability under no load conditions. Application of the mixed potential theory to carbon fluorine compounds, in general, explains the high reactivity of kinetically superior carbon fluorine compounds with the organic solvents. GRA

N75-22417# Rock Island Arsenal Lab., Ill. General Thomas J. Rodman Lab.
APPLICATION OF ATOMIC ABSORPTION SPECTROPHOTOMETRY TO THE ANALYSIS OF MOLYBDENUM IN HIGH ALLOY STEELS
Elizabeth A. Peterson Aug. 1974 10 p refs
(AD-A007136; RIA-R-TR-74-035) Avail: NTIS CSCL 07/2

A method is described of an analysis for molybdenum from 2-10 percent in high-alloy steels in which aqueous standards are used. Sample dissolution, standard preparation, and instrument parameters are described. Determinations of molybdenum in National Bureau of Standard samples by this method yielded acceptable results. GRA

N75-22418# Hebrew Univ., Jerusalem (Israel).
ENERGY TRANSFER BETWEEN INORGANIC IONS IN GLASSES Final Technical Report
Nov. 1974 53 p refs
(Contract DAJA37-74-C-1628)
(AD-A006644) Avail: NTIS CSCL 07/4

Absorption and fluorescence spectra of Er(3+) in germanate and tellurite glasses were obtained. Spontaneous transition probabilities were calculated using the Judd-Ofelt theory and intensity parameters obtained from measured integrated absorption coefficients. Quantum efficiencies of the fluorescences were measured by the comparative method and by the use of measured decay times. Multiphonon relaxation rates were calculated using the experimental data. Radiative transition probabilities from energy levels of Tm(3+) in glasses were calculated using the matrix elements obtained by intermediate coupling schemes and experimentally obtained intensity parameters. Nonradiative transition probabilities in different glass hosts were calculated. Quantum efficiencies of luminescence of rare earth in glasses can be predicted. Absorption and Fluorescence spectra of Sm(3+) were measured in GeO2, ternary germanate and borax glasses. From these the intensity parameters were calculated by use of Judd-Ofelt formula. Visible emission and decay times of Sm(3+) and its relative quantum efficiencies were measured. GRA

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion, and metallurgy.

N75-22419 Stanford Univ., Calif.
LATTICE DEFECTS IN ANNEALED GALLIUM ARSENIDE SINGLE CRYSTALS Ph.D. Thesis
Stephen Shang-Yi Chiang 1974 76 p
Avail: Univ. Microfilms Order No. 75-6818

Formation and diffusion mechanisms are studied of gallium and arsenic vacancies near the surface of gallium arsenide single crystals after annealing at 700 to 1000 degree centigrade in either vacuum or selected arsenic overpressures. Results from undoped n type gallium arsenide and cadmium doped p type gallium arsenide are similar. Two kinds of defects were introduced as the result of heat treatment: (1) donors having high concentration near the surface; and (2) acceptors having lower concentration but extending further into the crystal. The arsenic overpressure dependencies indicate that arsenic vacancies are donors and gallium vacancies are acceptors since their respective concentrations are proportional to the negative one-fourth and the positive one-fourth of the arsenic overpressure. Dissert. Abstr.

N75-22420 Washington Univ., St. Louis, Mo.
AN ULTRASONIC STUDY OF FERROMAGNETIC SINGLE CRYSTAL NICKEL Ph.D. Thesis
Icheng Wu 1974 108 p
Avail: Univ. Microfilms Order No. 75-6625

Bulk single crystals of nickel were studied by ultrasonic methods. Extensive dispersion measurements at frequencies of about 10 MH sub z and absorption measurements at 10 MH sub z and up to 210 MH sub z for various combinations of polarization of ultrasonic waves, and magnetic field strength and direction were made mainly at a temperature of 77 K. The data were taken with two single crystals of nickel in the form of disks obtained from two different sources. The discrepancy between the magnetoelastic theory and the experimental data (both dispersion and absorption) is explained semi-quantitatively by the theory of magnetization directional softness. Consequently, the anomalous resonance-like absorption effects, which have been the subject of controversy over the past ten years as to whether they are due to acoustic ferromagnetic resonance, were attributed to this non-resonance mechanism. Dissert. Abstr.

N75-22421 Oklahoma Univ., Norman.
THE THERMOPOWER OF DILUTE ALLOYS OF INDIUM Ph.D. Thesis
Arthur Wood Dudenhoeffer 1974 130 p
Avail: Univ. Microfilms Order No. 75-6511

An experimental investigation of a theory of electron-diffusion thermopower is discussed. The thermopower of indium is changed when impurity scattering centers are introduced. This change in the thermopower is analyzed as a function of temperature in terms of the Nielsen-Taylor theory and in terms of the competing process known as phonon drag. Definite conclusions as to the validity of the theory are hampered by the complex nature of phonon drag, but the experimental data is consistent with the Nielsen-Taylor theory. Dissert. Abstr.

N75-22422 Wisconsin Univ., Madison.
LOW ENERGY ELECTRON DIFFRACTION STUDY OF OXYGEN ADSORPTION ON TUNGSTEN (110) Ph.D. Thesis
Jeffrey Carl Buchholz 1974 236 p
Avail: Univ. Microfilms Order No. 75-2451

Low-energy electron diffraction was used to study the structure, vibrational properties, and ordering properties of the p(2 x 1) structure of oxygen adsorbed on tungsten. Averaging of intensity profiles at constant momentum transfer was used in the structure analysis to extract the kinematic intensity. The temperature dependence of the intensity and the angular profiles of the diffraction beams was used to study both the vibrational properties of the surface and an order-disorder transition occurring in the adsorbed layer. From the average data it is concluded that the clean tungsten surface is relaxed less than 3% from its normal position. The mean square vibrational amplitude normal to the surface is found to be about twice as large as for a bulk atom. The surface structure for adsorbed oxygen is found to involve no reconstruction of the tungsten substrate. Possible positions for the oxygen atom in the overlayer are considered. The adsorbed oxygen atom is found to have a smaller mean square vibrational amplitude than a first plane tungsten atom. Dissert. Abstr.

N75-22423 State Univ. of New York, Buffalo.
THE ROLE OF INCLUSIONS IN FREE MACHINING STEELS Ph.D. Thesis
Jayanta Hazra 1974 268 p
Avail: Univ. Microfilms Order No. 75-7759

Free-machining steels are typically steels which have been modified to contain an intentionally incorporated distribution of manganese sulphide and/or other inclusions. Analysis of the mechanisms by which the inclusions form, reveal that three morphologies of manganese sulphide may exist depending on the chemistry control and deoxidation practice employed during steelmaking. Experimental results obtained during machining of these modified steels (containing MnS inclusions of three different morphologies and also steels containing lead and lead-tellurium in addition to sulphur) under a wide range of cutting conditions varying from slow speed machining within the Scanning Electron Microscope to machining under industrial conditions are presented. The results show that at low speeds of machining, all the inclusions are nondeformable and cause chip fracture, thus, easing chip handling problems.
Dissert. Abstr.

N75-22424 North Carolina State Univ., Raleigh.
HYDROGEN INDUCED MICROSTRUCTURAL CHANGES IN SELECTED AUSTENITIC STAINLESS STEELS Ph.D. Thesis
James Michael Rigsbee 1974 80 p
Avail: Univ. Microfilms Order No. 75-7687

The effects of hydrogen cathodically introduced into fully recrystallized types 304 and 316L stainless steel were studied. Scanning electron microscopy analysis revealed that hydrogen induced cracking occurred transgranularly, intergranularly, and along twin boundaries. The extent and severity of the cracking was found to increase with increased charging time. Total intergranular embrittlement was revealed for the first several layers of grains from the charged surface. Transgranular cracking was observed to occur on well-defined planes in each grain. X-ray analysis, supported by magnetic analysis, has confirmed previously reported results showing that hexagonal closed peck structures and body-centered cubic martensitic phases can be induced by cathodic hydrogen charging. Both phases were identified in cathodically charged type 304 stainless steel. Transmission electron microscopy analysis revealed several different hydrogen-induced defect structure. Dissert. Abstr.

N75-22425 Iowa Univ., Iowa City.
THE ABSOLUTE THERMAL EXPANSION OF COPPER AND ALUMINUM BETWEEN 5 K AND 330 K Ph.D. Thesis
Frederick Robert Kroeger, Jr. 1974 121 p refs
(Contract W-7405-eng-82)
(AEC-IS-T-655) Avail: Univ. Microfilms Order No. 75-10486

The linear thermal expansion coefficients alpha of copper and aluminum have been measured in an absolute sense between 5 K and 330 K. A three terminal, ratio-transformer, ac capacitance bridge was used with a phase sensitive detector to measure the nominally 10 pF capacitances to a precision of 10 to the minus 7th power pF; changes of 0.02 A in the 10-cm sample length could be detected. The alpha (T) data were fit with fifth order polynomials in four overlapping temperature ranges. The absolute accuracy of the smoothed results ranges from + or - 0.1% above 50 K to + or - 0.5% near 20 K and + or - 1% at 10 K, reflecting the scatter in the data. The results of other measurements on copper and aluminum during the past 20 years also are compared to the present results via deviation plots. Dissert. Abstr.

N75-22426*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
RELATION OF STRUCTURE TO MECHANICAL PROPERTIES OF THIN THORIA DISPERSION STRENGTHENED NICKEL-CHROMIUM (TD-NiCr) ALLOY SHEET
John D. Whittenberger Washington May 1975 29 p refs
(NASA-TN-D-7988; E-8251) Avail: NTIS HC $3.75 CSCL 11F

A study of the relation between structure and mechanical properties of thin TD-NiCr sheet indicated that the elevated temperature tensile, stress-rupture, and creep strength properties depend primarily on the grain aspect ratio and sheet thickness. In general, the strength properties increased with increasing grain aspect ratio and sheet thickness. Tensile testing revealed an absence of ductility at elevated temperatures. A threshold stress for creep appears to exist. Even small amounts of prior creep deformation at elevated temperatures can produce severe creep damage. Author

N75-22427*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COMPOSITIONAL EFFECTS ON MECHANICAL PROPERTIES OF HAFNIUM-CARBIDE-STRENGTHENED MOLYBDENUM ALLOYS
Walter R. Witzke Washington May 1975 34 p refs
(NASA-TM-X-3239; E-8221) Avail: NTIS HC $3.75 CSCL 11F

The mechanical properties of swaged rod thermomechanically processed from arc melted Mo-2Re-Hf-C alloys containing as much as 0.9-mol% HfC were evaluated. The low-temperature ductilities of these alloys were not influenced by the amount of HfC present but by the amount of Hf in excess of stoichiometry. Maximum ductility occurred at 0.2- to 0.3-at.% excess Hf. At 0.3- to 0.5-mol% HfC, alloy strength varied directly with the Mo content of extracted carbide particles, both decreasing as the amount of excess Hf increased. Additions of 2-at.% Re had little effect on strength or ductility. Tensile and creep strengths of Mo-2Re-0.7Hf-0.5C alloy equaled or exceeded those of other high strength Mo alloys. Author

N75-22428# Pisa Univ. (Italy).
EXPERIMENTAL RESEARCH FOR CHARACTERIZING NICKEL-STEEL BY LOW TEMPERATURE INVESTIGATIONS WITH THE CRITERIA OF FRACTURE MECHANICS [RICERCA SPERIMENTALE PER LA CARATTERIZZAZIONE DI UN ACCIAIO AL NICHEL PER IMPIEGHI A BASSA TEMPERATURA CON CRITERI DELLA MECCANICA DELLA FRATTURA]
Costantino Carmignani, Paolo Cibecchini, and Sergio Reale 1974 28 p refs In ITALIAN
(Rept-37) Avail: NTIS HC $3.75

The results are reported of an experimental investigation of pressure vessels to determine, by strain gage techniques, the state of elastic deformation and the point of greatest perturbation from the fundamental state. The strain measurements were performed for the junction of a branched cylinder.
Transl. by F.O.S.

N75-22429# Pisa Univ. (Italy).
ON THE FATIGUE BEHAVIOR OF STRUCTURAL ELEMENTS OF AUSTENITIC STAINLESS STEEL AT HIGH TEMPERATURE [SUL COMPORTAMENTO A FATICA AD ALTA TEMPERATURA DI ELEMENTI STRUTTURALI IN ACCIAIO INOSSIDABILE DI TIPO AUSTENITICO]
A. DelPuglia 1974 37 p refs In ITALIAN Sponsored by CNR
(Rept-50) Avail: NTIS HC $3.75

The problem of predicting the fatigue resistance of metallic materials is discussed with emphasis on austenitic stainless steels at high temperatures. A research program for studying the properties of materials at high temperature is outlined, and equipment for fatigue testing is described. Transl. by F.O.S.

N75-22430# Oak Ridge National Lab., Tenn.
INITIAL ASSESSMENT OF THE STATUS OF HTGR METALLIC STRUCTURAL MATERIALS TECHNOLOGY
P. L. Rittenhouse Dec. 1974 57 p refs
(Contract W-7405-eng-26)
(ORNL-TM-4760) Avail: NTIS HC $4.25

Major components such as the steam generator and helium circulator - and their materials of construction - are described, and areas of uncertainty, particularly as they may relate to the safety of the system, are identified. Ongoing research aimed at the improvement and refinement of HTGR component and materials technology is summarized, and suggestions and priorities are given for present and future work. Author (NSA)

N75-22431# Massachusetts Inst. of Tech., Cambridge.
REVIEW OF DIFFUSIONAL CREEP OF Al2O3
R. M. Cannon and R. L. Coble 1974 40 p refs Presented at the Symp. on Plastic Deformation of Ceramics, Univ. Park, Pa., Jul. 1974 Sponsored by ERDA
(COO-2390-5; Conf-740724-4) Avail: NTIS HC $3.75

The diffusional creep mechanisms are reviewed including the extensions of the theories for application to ceramic materials. The creep data for Al2O3 are critically analyzed to show the relative conditions where normal and dislocation

controlled diffusional creep are important. The behavior at intermediate stresses, when both slip and diffusional creep occur, is also discussed. Author (NSA)

N75-22432# Atomics International, Canoga Park, Calif.
FERRITE FORMATION IN NEUTRON-IRRADIATED TYPE 316 STAINLESS STEEL
K. R. Garr and J. T. Stanley 31 Oct. 1974 22 p refs
(Contract AT(04-3)-824)
(AI-AEC-13140) Avail: NTIS HC $3.25

Magnetic measurements were made on Type 316 stainless steel specimens that had been neutron irradiated. A significant increase of magnetization was observed for the irradiated specimens. The shape of the magnetization versus field curves showed that the irradiated specimens contained many small superparamagnetic particles. The magnetic particles are assumed to be the ferrite phase although other possibilities cannot be excluded. The amount and distribution of the magnetic phase varied with pre-irradiation and post-irradiation heat treatment. The maximum value of magnetization was equivalent to 3.6% ferrite in a specimen annealed 100 h at 760 C before irradiation and 1 h at 500 C after irradiation at 425 C. Author (NSA)

N75-22433# Stanford Univ., Calif. Dept. of Materials Science and Engineering.
STRUCTURE DEPENDENCE OF HIGH TEMPERATURE DEFORMATION OF METALS Progress Report, 1 Dec. 1973 - 1 Dec. 1974
W. D. Nix and C. R. Barrett 1 Jan. 1975 59 p refs
(Contract AT(04-3)-326)
(SU-326P17-X6) Avail: NTIS HC $4.25

Work, completed on the structure and properties of Cr produced by physical vapor deposition is discussed. A technique was developed for producing refractory metal deposits with very fine grain sizes, as 3000 A in the case of Cr. It is hoped that such fine grained metals would have superior resistance to embrittlement and swelling in irradiation environments due to the high density of grain boundaries. The impurity effects in Cr appear to mask the effects of grain size, at least as regards brittleness, so that ductile Cr in irradiation environments is not feasible at the present time. A way was found to solve the problem of wedge crack growth along grain boundaries in the presence of cavities or gas filled bubbles. This theory leads to a creep rupture equation that is based on an approximate analysis of hole growth by creep. The analysis does not include the very important hole-hole interactions. The results indicate that net hole growth in simple tension occurs only through the effects of hole-hole interactions. NSA

N75-22434# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics.
SPIN DIFFUSION OF THE NUCLEAR MAGNETIC MOMENT IN DILUTE ALLOYS
A. Pawlikowski, I. L. Buchbinder, and A. L. Kuzemskii 1974 21 p refs In RUSSIAN
(JINR-P4-8209) Avail: ERDA Depository Libraries HC $4.25

A successive microscopic description of the nuclear magnetic relaxation in dilute alloys is developed. It is shown, that due to the dipolar interaction between host nuclear spins and impurity spins, a nonuniform distribution in the host nuclear spin system will occur and consequently the macroscopic relaxation time will be strongly determined by the spin diffusion. The expressions for the relaxation time in certain cases are given. Author (NASA)

N75-22435# Oxford Univ. (England). Dept. of Engineering Science.
STRAIN RATE EFFECTS IN 1.5 PER CENT CrMo STEEL Final Report
A. I. O. Zaid and J. Harding Sep. 1974 49 p refs
(Contract AT/2057/050/MAT-R)
(OUEL-1104/74) Avail: NTIS HC $3.75

Shear stress-strain curves are presented for tests at room temperature on a 2.5 CrMo steel quenched and tempered to six different hardness levels at strain rates from 0.003 to nearly 2000/s. The effect of strain rate on the flow stress at different shear strains for specimens of each hardness level is determined. Results are compared with those obtained in the first part of this research program on the same materials under high speed punching and with those obtained in earlier investigations into the behavior of different high strength steels under high speed tension. In all, these investigations rate-insensitive behavior was found at strain rates below about 50/s. At strain rates above about 50/s significant increases in flow stress with strain rate were found, the rate-sensitivity being dependent on the hardness of the test specimen. Author (ESRO)

N75-22436# Oxford Univ. (England). Dept. of Engineering Science.
THE TEMPERATURE AND STRAIN RATE SENSITIVITY OF ALPHA-TITANIUM
J. Harding Oct. 1974 34 p refs Presented at the Euromech 53 Colloq. on Thermoplasticity, Jablonna, Poland, 16-19 Sep. 1974 Sponsored in part by Sci. Res. Council
(OUEL-1108/74) Avail: NTIS HC $3.75

To provide data for a metal of hexagonal close packed structure, tensile tests were performed on specimens of annealed, commercially-pure, alpha-titanium at five temperatures from 77 to 288 K at six strain rates covering more than six orders of magnitude from 0.001 to 250 s. The tensile stress strain curves are presented. The variation with strain rate and temperature of the flow stresses at 0.2% and 5% plastic strain was determined, and the results are analyzed in terms of the theory of thermally-activated flow. A marked increase in the rate sensitivity of the flow stress was found in tests at all temperatures as the strain rate is increased above about 5 s. Further work on extension of the experimental data to higher strain rates is recommended to draw conclusions regarding the rate controlling mechanism in this region. ESRO

N75-22437# European Space Research Organization, Paris (France).
INVESTIGATION OF THE STRESS-CORROSION SUSCEPTIBILITY OF THE STEEL X 3 CrNiMoN 17 13 5, M. No. 1.4439 WITH THE CONSTANT STRAINING METHOD IN CaCl2 AND NaCl
Horst Buhl et al Feb. 1975 38 p refs Transl. into ENGLISH of "Untersuch. der Spannungskorrosionsempfindlichkeit des Stahles X 3 CrNiMoN 17 13 5, W.Nr. 1.4439, mit konstanter Dehnungsgeschwindigkeit in CaCl2 u. NaCl", DFVLR, Porz, West Ger. Report DLR-FB-74-48, 1 Jul. 1974 Original German report available from DFVLR, Porz, West Ger. 17 DM
(ESRO-TT-137; DLR-FB-74-48) Avail: NTIS HC $3.75

Depending on the strain rate the uniform elongation (limit of proportionality) of austenitic steel shows a minimum in CaCl2 at 119 C (246.2 F) at a strain rate of 0.25 mm/h (0.0095 in/h). This reveals stress corrosion susceptibility which can be avoided by a negative potential. In 1% NaCl at a pH of 7.5 and at room temperature, the material reveals no stress corrosion susceptibility in case of the potential being equal to the equilibrium potential or more negative than 0 V. Author (ESRO)

N75-22438# British Steel Corp., Sheffield (England). Information Services.
DETERMINATION OF HYDROGEN IN STEEL. THE EFFECT OF SAMPLE SURFACE CONDITION ON THE DETERMINATION OF HYDROGEN IN STEEL
N. Jenkins and A. A. Greenfield Oct. 1974 14 p refs Supersedes CAC/C/101/73
(PB-237965/9; CDL/CAC/50/74) Avail: NTIS HC $3.25 CSCL 11F

Work was carried out to assess the quantitative effect of surface oxides on the recovery of hydrogen from steel samples and to quantify further the need for surface preparation prior to analysis. It has been shown that, depending upon the surface area of the sample, the presence of an oxide coating reduces the amount of determined hydrogen by about 12 per cent compared with that recovered from an initially cleaned sample, whereas, if the oxide coating is removed by the preparative method recommended in the report the hydrogen recovered is only reduced by about 13 per cent. GRA

N75-22439# Mechanical Technology, Inc., Latham, N.Y.
ACOUSTIC EMISSION DETECTION OF FATIGUE CRACK INITIATION AND PROPAGATION IN NOTCHED AND UNNOTCHED TITANIUM SPECIMENS

M. S. Darlow, O. A. Shinaishin, and S. J. Aquaviva Jan. 1975 68 p refs
(Contract DAAG46-74-C-0154)
(AD-A007224; MTI-75TR18; AMMRC-CTR-75-1) Avail: NTIS CSCL 11/6

The purpose of this program is twofold. First, to assemble, check and demonstrate the operation of an acoustic emission instrumentation system for early detection of fatigue test specimen cracks, and to evaluate it as a tool for detecting the initiation and propagation of cracks in titanium fatigue specimens. This method has been selected because the acoustic emission technique has unique abilities in the detection of crack initiation in specimens during the application of static or dynamic loads, and in monitoring material internal changes under these loads. Second, to seek the development of relationships between the acoustic emissions of the specimen and the degree of damage due to crack presence and growth for titanium fatigue specimens. The development of these relationships would lead directly to a further understanding of the mechanisms of failure of these specimens. Of specific interest is the relationship of crack initiation and growth to the fatigue life cycle. GRA

N75-22440# Southwest Research Inst., San Antonio, Tex. Dept. of Materials Sciences.
AN EXPERIMENTAL INVESTIGATION OF DYNAMIC MATERIAL PROPERTIES Final Report, 1 Sep. 1964-30 Nov. 1973
U. S. Lindholm and D. L. Davidson Jan. 1975 18 p
(Contract DA-31-124-ARO(D)-273; SwRI Proj. 02-1568)
(AD-A007209; ARO-3134-9-E) Avail: NTIS CSCL 11/6

This report summarizes work performed over a 12-year period concerned with the mechanical properties of materials deformed under high strain rate or impact conditions. The work included the development of uniaxial and biaxial testing equipment for dynamic plastic deformation studies, the use of this equipment for generating stress-strain-strain rate relations for a number of metals and alloys over a wide temperature range, and the correlation of this data in the form of appropriate constitutive equations. A list of publications resulting from this work is included. GRA

N75-22441# Cincinnati Univ., Ohio. Dept. of Aerospace Engineering.
AN EXPERIMENTAL INVESTIGATION OF THE PARTICLE DYNAMICS OF QUARTZ SAND IMPACTING 6Al-4V TITANIUM AND 410 STAINLESS STEEL IN AN EROSIVE ENVIRONMENT
R. Ball and W. Tabakoff Oct. 1974 39 p refs
(Contract DAHC04-69-C-0016)
(AD-A007213; ARO-T-4-67-E; Rept-74-43) Avail: NTIS CSCL 11/6

The impact and rebound characteristics of high speed erosive quartz particles have been experimentally determined. The impact parameters were found to be statistical in nature and the statistical distributions were obtained. The alloys used in this investigation were 410 stainless steel and 6Al-4V. Because of the increased usage and interest in vehicles which operate on and over unprepared and dusty terrains (helicopters, hovercraft and V/STOL aircraft), recent interest in this field is involved with the prediction of erosion in aero turbomachinery. GRA

N75-22442# Marvalaud, Inc., Westminster, Md.
THE INFLUENCE OF MICROSTRUCTURE ON THE PLASTICITY OF METALS AND ALLOYS Final Report
S. VanDoren Feb. 1975 121 p refs
(Contract DAAD05-73-C-0517)
(AD-A007216; BRL-CR-210) Avail: NTIS CSCL 11/6

Four materials; OFHC copper, aluminum-copper eutectic (8.3 wt % Al) alloy, lead-tin eutectic and aluminum-zinc eutectoid (.78 wt % zinc) were tested in three different tests at a range of loading rates. The first constrained at the base. The second test was a closed die extrusion of a cylindrical specimen. The third test was the impact of an unconstrained cylindrical specimen between flat-faced cylindrical rams. The peak loading rate from .006 ft/sec to 650 ft/sec. GRA

N75-22443# Naval Research Lab., Washington, D.C.
AN ELASTO-CHEMICAL THEORY OF GRAIN BOUNDARIES Final Report
R. A. Masumura and M. E. Glicksman 14 Feb. 1974 44 p refs
(RR0220146)
(AD-A006653; NRL-7851) Avail: NTIS CSCL 11/6

An infinite periodic heterophase dislocation array is used as a model of a tilt boundary near the melting point of a crystalline solid. The elastic interaction among dislocations is included via a traction-free-core boundary condition. The elastic energy is coupled to the chemical energy from the core by an energy minimization scheme of the core radius. The theory yields the total grain boundary energy as function of tilt misorientation, which is found to compare favorably with experiments on bismuth. GRA

N75-22444# Naval Research Lab., Washington, D.C.
X-RAY-LINE-PROFILE-ANALYSIS TITANIUM ALLOYS Final Report
E. A. Metzbower 4 Feb. 1975 19 p refs
(RR0220146)
(AD-A006654; NRL-7853) Avail: NTIS CSCL 11/6

X-ray-line-profile analysis has been used to investigate the dislocation structures resulting from severe plastic deformation in a series of titanium alloys. The effect of oxygen level (up to 0.33 wt-%) on the dislocation arrangements in titanium as well as in a series of titanium-aluminum alloys (4, 6, and 9 wt-% Al) was the principal thrust of the investigation. Four commercial alpha-phase titanium alloys (Ti-7Al-2Cb-1Ta, Ti-5Al-2.5Sn, Ti-7Al-12Zr, and Ti-4Al-3Mo-1V) were also examined. Although correlations were found between the stacking fault probability and alloying elements, the dislocation arrangements can not be interpreted solely in terms of stacking fault energies. Short-range order definitely plays an important role, and solute-dislocation interactions may be active. GRA

N75-22445# Naval Surface Weapons Center, Dahlgren, Va.
SHOCKED-SPECIMEN SOFT RECOVERY SYSTEM FOR DYNAMIC FRACTURE STUDIES
W. H. Holt and W. Mock, Jr. Feb. 1975 30 p refs
(AD-A006659; NSWC/DL-TR-3238) Avail: NTIS CSCL 11/6

A system that permits the soft recovery of specimens shock-loaded with a gas gun has been designed and put in operation. The recovered specimens are used for metallurgical examination in studies of dynamic fracture processes. The function of the system is to separate the impacting projectile from the impacted specimen to prevent subsequent specimen damage. The system has been tested for projectile velocities up to 1050 ft/sec. This velocity range is adequate for studies of microscopic spall fracture. GRA

N75-22446# Michigan Technological Univ., Houghton. Dept. of Metallurgical Engineering.
THERMALLY ACTIVATED DEFORMATION OF PRECIPITATION HARDENED BETA TITANIUM ALLOY SINGLE CRYSTALS
Steven M. Tuominen and Donald A. Koss Feb. 1975 25 p refs
(Contract N00014-72-A-0377-0001)
(AD-A006606; TR-2) Avail: NTIS CSCL 11/6

The temperature dependence of the flow stress behavior has been measured from 77 to 740 K for age-hardenable beta-phase (bcc) Ti-40V-1Si alloy single crystals. For solution-treated and aged crystals, an increase in the athermal yield stress at 740 K is accompanied by a decrease in the temperature dependence of the yield stress. Direct electron microscopy observations, slip character, and work hardening behavior indicate that the precipitate particles are predominantly sheared in the conditions tested. It is suggested that the reduced temperature dependence of the yield stress with aging results from: (a) the relative flow stress difference of screw vs. edge dislocations moving through penetrable obstacles and (b) solute association which may occur during aging. GRA

N75-22447# Army Materials and Mechanics Research Center, Watertown, Mass.
STRAIN RATE EFFECTS IN BRITTLE AND TOUGH MATERIALS Final Report
Milton M. Mardirosian Dec. 1974 41 p refs

(DA Proj. 1T0-62105-A-328)
(AD-A007141; AMMRC-TR-74-34) Avail: NTIS CSCL 11/6

Strain rate sensitivity effects and strain hardening characteristics at room, elevated, and subzero temperatures were evaluated for a wide variety of both tough and brittle materials including 4340, 52100, and HF-1 steels, 6Al-4V and 6Al-6V-2Sn titanium alloys and the 8Mo-1/2Ti uranium alloy. Mechanical property parameters such as true stress, true strain, true fracture stress, ultimate and yield strengths, tension modulus, and reduction of area are examined under a temperature environment ranging from -116 C to +260 C over a strain rate spectrum of 0.001/sec to 500/sec. GRA

N75-22448# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
STUDY OF DECOMPOSITION OF A HIGHLY SUPERSATURATED SOLID SOLUTION OF A GRANULATED ALLOY, Al-1, 5 Cr-1, 5 Zr
K. Imanov, S. Gorczyca, and K. Przybylowicz 22 Jan. 1975 18 p refs Transl. into ENGLISH from Arch. Hutnictwa (Warsaw), v. 17, no. 4, 1972 p 315-326
(AD-A006850; FTD-HC-23-0607-75) Avail: NTIS CSCL 11/6

The mechanism and kinetics of decomposition of a highly supersaturated solid solution in an alloy is of importance in stating the proper technology for producing materials from granules. The investigation has been performed on granules in a cast state and plastically worked by flattening, after annealing at different temperatures (up to 680 C). The following tests were applied: microscopy, micro-hardness, electron microscopy (with the use of thin foils), electronic microprobe and X-rays. Softening occurs more readily in granules previous to deformation than in cast ones. The precipitated particles at lower temperatures are characterized by great dispersion. They are in intermetallic phases Al3Zr and Al7Cr. Electron microscopy showed that during annealing up to 250 C, there is a great density of dislocations. A hypothesis is presented concerning the structural changes occurring at heating the highly supersaturated solid solution of this alloy. GRA

N75-22449# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SKULL MELTING INGOTS OF TITANIUM ALLOYS
M. I. Musatov and A. Sh. Fridman 3 Jan. 1975 11 p Transl. into ENGLISH from Tekhn. Legkikh Splavov (USSR), no. 2, 1970 p 126-128
(AD-A006851; FTD-HT-23-0084-75) Avail: NTIS CSCL 11/6

The advantages of the skull method of melting are demonstrated, and its place in the technological system of ingot production is defined. Examined is the set-up of a skull furnace with consumable and permanent electrodes designed for the purpose of obtaining ingots of titanium alloys. The principle of skull melting is that the metals under the influence of the arc or any other source of heat are melted in a melting bath of a solid metal (skull) of the same composition a. GRA

N75-22450# Virginia Univ., Charlottesville. Dept. of Materials Science.
INVESTIGATION OF SUPERPLASTICITY IN THE Zn-Al EUTECTOID AND THE Mg-Al EUTECTIC Final Report
Glenn W. Franti and H. G. F. Wilsdorf Feb. 1975 44 p refs (Contract N00014-69-A-0060-0007)
(AD-A006966; MS-3557-102-75) Avail: NTIS CSCL 11/6

The work was involved with deforming samples of the Zn-Al and Mg-Al eutectoid of various grain sizes and at constant temperature using constant strain rates, then correlating the microstructure, after deformation, to the differences in deformation behavior, and using the existing theories of superplasticity in an attempt to relate the experimental results to theoretical predictions. GRA

N75-22495 Nottingham Univ. (England). Dept. of Metallurgy and Materials Science.
PHYSICS AND METALLURGY OF FRETTING
R. B. Waterhouse *In* AGARD Specialists Meeting on Fretting in Aircraft Systems Jan. 1975 17 p refs Sponsored by Min. of Def. and Sci. Res. Council (For availability see N75-22487 14-31)

N75-22496 Metaalinstitut TNO, Apeldoorn (Netherlands).
SURFACE DISTRESS OF COPPER ALLOYS IN CONTACT WITH STEEL UNDER FRETTING CONDITIONS
A. Begelinger and A. W. J. DeGee *In* AGARD Specialists Meeting on Fretting in Aircraft Systems Jan. 1975 10 p refs (For availability see N75-22487 14-31)

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N75-22451 North Dakota State Univ., Fargo.
SOLUBILIZATION AND SPORE RECOVERY FROM SILICONE POLYMERS Ph.D. Thesis
Yu-Chuan Hsiao 1974 146 p
Avail: Univ. Microfilms Order No. 75-5967

Non-sporicidal degradation of cured silicone polymers was studied by two different methods: (1) chemical degradation of cured silicone polymers by amine solvents at room temperature and, (2) mechanical degradation of solvent swollen samples using the concept of solubility parameter to select the best solvent for swelling. Viability studies were made using the first method. The chemical degradation of cured inoculated silicone potting compounds by n-butylamine solvent at room temperature was followed by serial dilution with benzene. A plate count technique which allowed the evaporation of amine solvent during the incubation gave a very high spore recovery. Dissert. Abstr.

N75-22452 Akron Univ., Ohio.
INVESTIGATIONS INTO THE ADHESION BETWEEN GLASSY POLYMERS Ph.D. Thesis
Ismail Saltuk 1974 174 p
Avail: Univ. Microfilms Order No. 75-9373

The failure of adhesion between heat and pressure bonded dissimilar glassy polymers was studied in terms of their material properties, the mechanics of cleavage, and the effects of the environmental temperature. The test procedure included a double cantilever beam cleavage and a single cantilever beam cleavage process. The adhesive failure energy was found to be higher when polystyrene was cleaved as a single cantilever beam than when more ductile polycarbonate was cleaved. Microscopic investigations showed cohesive failure on polystyrene surface. Higher values of the beam and/or composite stiffness, the bonding temperature, and the environment test temperature had a positive effect on the adhesive failure energy. The contribution of thermal strain energy to the failure process was found to be as high as 25 percent of the cleavage strain energy at -20 C.
Dissert. Abstr.

N75-22453*# Kanner (Leo) Associates, Redwood City, Calif.
THE MEANING OF THE BASICITY OF GLASS MELT AND ATTEMPTS TO MEASURE IT, PART 2
W. Stegmaier and A. Dietzel Washington NASA Apr. 1975 31 p refs Transl. into ENGLISH from Glastech. Ber. (Frankfurt am Main), v. 18, no. 12, Dec. 1950 p 353-362
(Contract NASw-2481)
(NASA-TT-F-16272) Avail: NTIS HC $3.75 CSCL 11B

The basicity relations of a few simple glass systems (Li, Na, K) are studied. Electromotive force values were obtained by pouring two different glass melts into a ceramic crucible. The potential curves of all three glasses had essentially the same character: at first the curve is flat, then it climbs radically, and finally it is flat again. These variations are explained in terms of molecular structure, in particular the various ion field strengths. Changes in basicity were studied with a color indicator (CoO for low-alkali regions, S for high-alkali regions). Only the order of basicity could be determined; it was not possible here to ascertain if a melt was acidic or basic, or where an actual neutral point would lie. Author

N75-22454*# Scientific Translation Service, Santa Barbara, Calif.
OBSERVATIONS ABOUT THE STRUCTURE OF ALKALI SILICATE GLASSES AND MELTS AFTER THE INSERTION OF OH GROUPS

Helmut Franz and Tabor Kelen Washington NASA May 1975 27 p refs Transl. into ENGLISH from Glastech. Ber. (Frankfurt am Main), v. 4, Issue 4, Apr. 1967 p 141-148
(Contract NASw-2483)
(NASA-TT-F-16270) Avail: NTIS HC $3.75 CSCL 11B

Regularities are predicted by electron/theory for the alkali distribution in binary alkali silicate glasses and for the reaction of water vapor with the silicate melt. The dissolved water is installed as OH groups, the bond-state of which is a very sensitive indicator for the structure of the near surroundings. Structural details such as generation of alkali 'swarms' and occupation-state of the single SiO4 tetrahedron by alkali ions are discussed using the infrared spectra of water-containing glasses. Author

N75-22455*# Scientific Translation Service, Santa Barbara, Calif.
THE IMPORTANCE OF BASICITY IN GLASS MELTS AND ATTEMPTS AT ITS MEASUREMENT, PART 1
W. Stegmaier and A. Dietzel Washington NASA May 1975 41 p refs Transl. into ENGLISH from Glastech. Ber. (Frankfort), v. 18, no. 11, Nov. 1940 p 297-308
(Contract NASw-2483)
(NASA-TT-F-16269) Avail: NTIS HC $3.75 CSCL 11B

The concentration of oxygen ions is used as the scale to define the basicity of glass melts. The basicities are compared in different materials with the aid of color indicators and are tracked electrochemically through changes in the concentration of oxygen ions in the case of Li, Na, and K borate glasses. The results are presented. Author

N75-22456# Explosives Research and Development Establishment, Waltham Abbey (England)
THE STRENGTH OF THERMOPLASTIC MATERIALS. PART 1: CRITICAL STRESS CRACKING IN UNIAXIAL TENSION OF POLYMERS WITH PHENYLENE GROUPS IN THE MAIN CHAIN
B.J. MacNulty Oct. 1973 22 p refs
(ERDE-TR-145; BR43696) Avail: NTIS HC $3.25

Results on critical stresses at which catastrophic failure occurs within a few seconds of liquid contact with polymers such as polyethylene terephtalate, bakelite phenoxy resins, polycarbonate, polysulfone, and polyphenylene oxide under uniaxial tension are reported. Tensile and bend test experiments are described. Preliminary results and critical values of the stress for breaking on liquid contact at room temperature are given. Temperature and time dependence effects are discussed. The experimental results compared with qualitative results on cracking and crazing in biaxial films show that biaxial stress is more likely to cause crazing than pure tension and may also be more severe for cracking. ESRO

N75-22457# Institut Franco-Allemand de Recherches, St. Louis (France).
INVESTIGATION ON THE PIEZOELECTRICITY OF EXPLOSIVES [UNTERSUCHUNG VON EXPLOSIVSTOFFEN AUF PIEZOELEKTRIZITAET]
H. H. Licht and M. Schwertl 1 Apr. 1974 29 p refs In GERMAN
(ISL-18/74) Avail: NTIS HC $3.75

Using equipment which allows measurements on crystals of random form, 39 explosives were tested on the presence, or the absence, of the piezoelectric effect. A positive effect was found for some explosives. The charges occurring under static or dynamic loads in the piezoelectric explosives nitropenta were measured. ESRO

N75-22458# National Bureau of Standards, Washington, D.C. D. C. Fire Technology Div.
EVALUATION OF THE FIRE PERFORMANCE OF A DIBROMOTETRAFLUORETHANE-BLOWN RIGID POLYURETHANE FOAM Final Report
T. G. Lee, W. J. Parker, and M. Tryon Apr. 1974 18 p refs Sponsored in part by Naval Ship Res. and Develop. Center, Bethesda, Md.
(COM-74-11793/8; NBSIR-74-456) Avail: NTIS HC $3.25 CSCL 11I

The fire performance characteristics of a dibromotetrafluorethane blown rigid polyurethane foam were measured by several laboratory test methods. Measurements included: surface flammability, smoke and gases generated at elevated temperature and during combustion, ignition temperature, rate of heat release, and fire growth. GRA

N75-22459# Tennessee Technological Univ., Cookeville. Dept. of Engineering Science.
RAIN IMPACT DAMAGE TO SUPERSONIC RADOMES Final Report, 17 Nov. 1971 - 30 Jun. 1974
Ray Kinslow, Dallas G. Smith, Vireshwar Sahai, Leland Long, and John Peddieson, Jr. Oct. 1974 468 p refs
(Contract DAAH01-72-C-0275)
(AD-A007157; TTU-ES-74-3; RL-75-5) Avail: NTIS CSCL 09/5

The research described has been directed toward a better understanding of raindrop damage to vehicles traveling at very high velocities with emphasis upon the erosion of ceramic-type radomes. An accelerator capable of impacting targets with short water jets at speeds up to Mach 5 is described. The validity of using high-speed liquid jets to simulate raindrop impact is demonstrated. Topics covered include: drop energy-crater volume relations; oblique and multiple impacts; erosion rates; internal fracturing and spallation caused by stress waves; radome coatings; information from rocket sled tests; a theoretical analysis of the cratering process; motion of raindrops in the supersonic shock layer; probability modeling of erosion; and spatial and temporal variations of pressure exerted on the target surface by liquid impacts. GRA

N75-22460# Catholic Univ. of America, Washington, D.C. Vitreous State Lab.
VISCOELASTIC PROPERTIES OF A PERFLUOROALKYLPOLYETHER LUBRICANT (MLO-71-6)
Oct. 1975 24 p refs
(Contract N00014-67-A-0377-0018; NR Proj. 22P-007)
(AD-A006660; TR-3) Avail: NTIS CSCL 11/8

Results of a study of the viscoelastic properties of a synthetic perfluoroalklpolyether lubricant Krytox 143 AC (MLJ-71-6) are described. Data were obtained using laser light scattering, ultrasonic and standard viscometric techniques. Viscosities of over 10 to the 8th power poise have been measured. Comparison is made with results reported on fluid of the same type by A. Cameron and G. Paul using their dynamic falling ball viscometer. GRA

N75-22461# Rutgers Univ., New Brunswick, N.J. Dept. of Mechanics and Materials Science.
THE EFFECTS OF MOLECULAR WEIGHT ON THE PRESSURE-DEPENDENT MECHANICAL PROPERTIES OF POLYPROPYLENE
K. D. Pae, B. A. Newman, and T. P. Sham 31 Jan. 1975 33 p refs
(Contract N00014-67-A-0115-0007; NR Proj. 356-564)
(AD-A006916; TR-2) Avail: NTIS CSCL 20/12

Tensile tests and compression tests of polypropylene (PP) samples with different molecular weights have been carried out at various high pressures. Three different molecular weights were studied up to pressures of 6 kbars. At a given pressure, the effect of increasing molecular weight was to decrease the modulus and the strength. Observations could be explained by a pressure-induced shift of the beta-transition to room temperature. The elongation to fracture and the mode of fracture were found to depend on the molecular weight. The influence of the pressure medium on the observed tensile behavior was also studied. The pressure medium was observed to influence the deformation behavior only for the case of the lower molecular weight samples. GRA

N75-22462# Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Materials Engineering.
STATIC FATIGUE IN GLASS: A REAPPRAISAL
Robert H. Doremus and Edward K. Pavelchek Feb. 1975 43 p refs
(Contract N00014-67-A-0117-0014; NR Proj. 032-531)
(AD-A006935) Avail: NTIS CSCL 11/2

The delayed failure of soda-lime glass was tested after different surface and heat-treatments and at different humidities. It was found that the treatment history of the glass strongly influenced the characteristic times of failure and the effect of humidity on

these times. However, the functional dependence of log failure time on relative stress was similar for most treatments. Analysis of the distributions of failure times at particular stresses showed that the log failure time was not linear with applied stress, as often assumed. The experimental data fit better inverse proportionality between log time and relative stress. Analysis of previous data on crack propagation (k-v curves) in glass showed this proportionality also. Some theoretical reasons for these results are examined. GRA

N75-22463# Rensselaer Polytechnic Inst., Troy, N.Y.
TRANSITION METAL IONS AND HETEROGENEOUS NUCLEATION IN GLASS. A MAGNETIC STUDY OF THE CATALYSED CRYSTALLISATION OF A CaO-MgO-Al2O3-SiO2 GLASS USING Fe2O3 Annual Report
Deug W. Moon, Joseph C. Williams, Robert K. MacCrone, and Kyung J. Kim Jan. 1975 71 p refs
(Contract N00014-67-A-0117-0017; NR Proj. 032-518)
(AD-A006636; RPI-JBD35-2; TR-2) Avail: NTIS CSCL 11/2

Magnetization measurements have been made on (mole %) 28.9 CaO14.3 MgO-11.4 Al2O3-40.4 SiO2 glass containing 5 mole % Fe2O3 from 300 K to 50 mK. Electron paramagnetic resonance measurements were also made on these specimens at 300K. A qualitative elucidation of the mechanism of catalyzed crystallization has been obtained namely (1) that clusters of Fe ions already exist in quenched glass (2) on nucleation at lower temperatures the clusters clump together with little evidence of crystallinity (3) on nucleation at higher temperatures the clusters clump together with evidence of crystallinity (4) the Fe(2+)/Fe(3+) ratio decreases with increasing nucleation temperature, and this oxidation state probably sets the crystalline phase observed after crystallization (5) on crystallization, Fe3O4 or gamma Fe2O3 or MgFeAlO4 form, depending upon the temperature of nucleation (6) the catalyzed crystallization of the major phase is apparently by the epitaxial growth around small crystallites of the above magnetic phases. GRA

N75-22464# Air Force Aero Propulsion Lab., Wright-Patterson AFB, Ohio.
A STUDY OF SELECTED PARAMETERS INFLUENCING LUBRICANT LOAD CARRYING CAPACITY DETERMINATION Final Report, Jun. 1971 - Oct. 1974
Everett A. Lake Jan. 1975 269 p refs
(AF Proj. 3048)
(AD-A006673; AFAPL-TR-74-98) Avail: NTIS CSCL 11/8

The Standard Method of Test for Load-Carrying Capacity of Fluid Gear Lubricants, American Society for Testing and Materials Designation D1947, controls the procedure, test rigs, test items, and reporting methods with respect to evaluating lubricant gear load capacity. Prior to evaluation of U.S. gas turbine engine lubricants, the rigs and associated devices are performance checked with a standard lubricant, Reference Oil C. Observations of these calibration data have shown the mean gear load capacity to be nonuniform. Further, the data is believed to be excessively scattered. As a result, this program was undertaken to determine the effect of test gears manufactured at two different points in time, the type of lubricant, and the test rig configuration upon gear load capacity. Statistical analysis of program data reveals the test gears and the type of lubricant to be, with 95% confidence, the sources of variation. GRA

N75-22465# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE DEFORMATION OF POLYMERS, CHAPTERS 14 AND 15
A. A. Askadskii 21 Jan. 1975 141 p refs Transl. into ENGLISH from the monograph "Deformatsiya Polimerov" USSR, 1973 p 374-442
(AD-A006557; FTD-HC-23-2119-74) Avail: NTIS CSCL 20/12

Fracture and softening in polymers are discussed, and the relationships to deformation. GRA

N75-22501 Fiat S.p.A., Turin (Italy).
SELF-LUBRICATING POLYMERS
Alfredo Franceschini *In* AGARD Specialists Meeting on Fretting in Aircraft Systems Jan. 1975 17 p refs (For availability see N75-22487 14-31)

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers, storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N75-22466 Oklahoma State Univ., Stillwater.
FORMATION OF NO(X) DURING FUEL OIL COMBUSTION Ph.D. Thesis
Ryan Delacy Moats, Jr. 1974 301 p
Avail: Univ. Microfilms Order No. 75-8837

The influence of nitrogen compounds in fuel oil on the formation of NO sub x during combustion is studied using various gases. Three sets of variables are investigated; (1) Percent excess oxygen: (2) percent nitrogen in fuel oil; and (3) nitrogen or argon as inert gas. It is shown that NO sub x formed during the combustion of fuel oil depends upon flame temperature and percent fuel nitrogen. Since temperature is a function of percent excess oxygen, NO sub x also depends upon excess oxygen. Atmospheric nitrogen does not play a dominant role in forming NO sub x. Dissert. Abstr.

N75-22467# Institut fuer Chemie der Treibstoffe, Berghausen (West Germany).
PROPERTIES OF FAST BURNING COMPOSITE DOUBLE BASE FUELS [EIGENSCHAFTEN SCHNELLBRENNENDER CDB-TREIBSTOFFE]
W. Kloehn 31 Dec. 1973 25 p refs In GERMAN
(ICT-13/73) Avail: NTIS HC $3.25

Preparation and properties of composite double base propellants containing ammonium perchlorate, aluminum, cellulose nitrate, nitroglycerine, and a polyurethane binder as main constituents, are described. The burning rate of the propellants, manufactured using the slurry cast method, can be varied within the velocity range from 20.0 to 70.0 min/s at 130 bar. The elongation values of the propellants, which have a viscoelastic behavior, are better than those of comparable composite propellants. The thermal stability is found to be satisfactory, and manufacture is possible well within the usual security measures. ESRO

N75-22468# Explosives Research and Development Establishment, Waltham Abbey (England).
RHEOLOGICAL CHARACTERISATION OF PLASTIC PROPELLANT BY EXTENSION UNDER CONSTANT LOAD
W. A. Dukes Jan. 1974 33 p refs
(ERDE-TR-154; BR42768) Avail: NTIS HC $3.75

The extension of plastic propellant under constant load was analyzed and parabolic flow curves were derived, in agreement with previous parallel plate plastometer results (in compression). The existence of finite yield stresses, of the same order as those measured more accurately by parallel plate plastometry, was also established, and the presence of linear shear hardening confirmed. No evidence of strain thinning was found. It is found that since tensile testing leads to earlier instability, such as necking and fracture, than does compression, material of low plasticity shows divergence at relatively low values of strain. Another disadvantage of the present experimental technique is that there is only a relatively narrow range of strain rate available, when compared with the parallel plate plastometer. In addition, it might be argued that there is little to recommend constant load extension measurements on plastic propellants relative to the simple plasticity test combined with parallel plate plastometry. ESRO

N75-22469# Institut Franco-Allemand de Recherches, St. Louis (France).
SHOCK WAVE SENSITIVITY OF POWDERED HEXOGEN [SENSIBILITE A L'ONDE DE CHOC DE L'HEXOGENE PULVERULENT]
Y. DeLongueville, H. W. Koch, and L. Philipp 4 Jun. 1974 56 p refs In FRENCH
(Contract SNPE-14/73/D)
(ISL-20/74) Avail: NTIS HC $4.25

Impact resistance under shock wave of powdered hexogen

for two granulometric distributions and various grain shapes is presented. A double sheet method was used to reduce the impact velocity to 440 m/s using F4HV detonator, aluminum brass, and a secondary aluminum sheet as shock wave generator. The preparation and characterization of the hexogen samples is detailed. In a diagram shock pressure vs shock duration, the critical sensitivity curves cross each other. None follows the isoenergetic curves. ESRO

N75-22470# Ballistic Research Labs., Aberdeen Proving Ground, Md.
EFFECT OF EXTERNAL THERMAL RADIATION ON THE BURNING RATE OF DOUBLE BASE SOLID PROPELLANTS (STEADY STIMULUS)
M. M. Ibiricu, W. P. Aungst, and F. A. Williams Feb. 1975 67 p refs
(DA Proj. 1T1-61102-A-32C)
(AD-A007131; BRL-1757) Avail: NTIS CSCL 21/2

A model has been developed that describes the thermal interaction of an externally applied radiant energy flux with the combustion zone of a burning homogeneous solid propellant. It is shown that only the radiation reaching the propellant surface, and absorbed within the solid phase, can effectively induce burning rate augmentation. Many conditions have been investigated in detail, including the limiting cases of solid-phase surface absorption and deep in-depth absorption with heat generation. This extensive examination has permitted the identification of the necessary conditions for treating the effect of radiation as an increase in the initial propellant temperature. The conditions at which such an equivalence principle is not applicable have also been identified. By extension of the theory, important subsidiary effects on temperature sensitivity have been identified, particularly the role of stabilizers and other propellant ingredients. GRA

N75-22471# Air Force Weapons Lab., Kirtland AFB, N.Mex.
ENVIRONMENTAL ANALYSIS OF POSSIBLE SULFUR INCREASES IN USAF JET FUELS Final Report
Dennis F. Naugle Feb. 1975 22 p refs
(AF Proj. 2103)
(AD-A006802; AFWL-TR-74-215) Avail: NTIS CSCL 21/2

This analysis addresses the question of whether environmental considerations should be the limiting constraint to possible increases in sulfur content of USAF jet fuels. Such increases are proposed in order to increase the availability of jet fuels such as JP-4. The current average sulfur content of 0.05% by weight and two hypothesized levels of 0.4 percent and 1.0 percent are analyzed in this study. Aircraft emissions and meteorological conditions around an airbase are maximized to produce predicted worst-case ambient air quality levels. GRA

N75-22472# Naval Research Lab., Washington, D.C.
SUPPRESSION OF EVAPORATION OF HYDROCARBON LIQUIDS AND FUELS BY FILMS CONTAINING AQUEOUS FILM FORMING FOAM (AFFF) CONCENTRATE FC-196 Interim Report
J. T. Leonard and J. C. Burnett 31 Dec. 1974 26 p refs
(NRL Proj. C05-19; SF38451)
(AD-A006650; NRL-7842) Avail: NTIS CSCL 13/2

Suppression of evaporation of hydrocarbon liquids and fuels by aqueous films containing a fluorocarbon surfactant has been examined as a function of film thickness, time, and hydrocarbon type. The hydrocarbon liquids included the homologous series of n-alkanes from pentane to dodecane, aromatic compounds, motor and aviation gasolines and jet fuels JP-4 and JP-5, and Navy distillate fuel. The surfactant solution used to form the films was a 6% solution of Aqueous Film Forming Foam (AFFF) concentrate FC-196. Films of the surfactant solution, ranging in thickness from 5 to 100 micrometers, were placed on the surface of the hydrocarbon liquid to test the ability of the film to suppress evaporation over a 1-hr period. Results indicated that for the n-alkanes and the hydrocarbon fuels a certain critical thickness of surfactant solution was required for optimum vapor suppression. In comparison with the n-alkanes, it was considerably more difficult to suppress evaporation of the aromatic compounds. GRA

N75-22473# Army Foreign Science and Technology Center, Charlottesville, Va.
DETERMINATION OF NONUNIFORMITY OF FUEL MIXTURE DISTRIBUTION TO CYLINDERS IN ACCELERATION MODES
V. M. Arkhangelskii and A. V. Skotta Jun. 1974 10 p refs
Transl. into ENGLISH from Avtomob. Prom. (USSR), no. 11, 1971 p 5-7
(AD-A001495; FSTC-HT-23-462-74) Avail: NTIS CSCL 21/7

A device is described for automatic sampling of exhaust gas at each outlet of an eight-cylinder engine, at various times during settled and acceleration modes of engine operation. CO and CO2 content of the samples is determined by optical-acoustical gas analyzers. On the basis of a large amount of experimental data, formulas are derived for determining the coefficient of excess air in each sample and an average coefficient for the engine. The principal causes of differences in irregularity in distribution of the fuel mixture to the engine cylinders in various operating modes should be considered to be change in the nature of mixture formation during acceleration. GRA

N75-22474# Ogden Air Logistics Center, Hill AFB, Utah.
PROPELLANT SURVEILLANCE REPORT LGM-30A AND B STAGE 1 TP-H1011 Semiannual Report
John A. Thompson Jan. 1975 134 p
(AD-A007037; MANCP-316(75)) Avail: NTIS CSCL 21/9

This report contains propellant test results from cartons of TP-H1011 bulk propellant representing LGM-30A and B First Stage Minuteman Motors. This report is the seventh time that a statistical approach has been used to analyze First Stage bulk carton propellant. The purpose of testing was to determine and provide early warning of any serious degradation trends occurring in the propellant for service life predictions. An analysis of all parameters indicates that no potential problems are expected in the propellant for at least two years past the oldest data point. GRA

N75-22475# Ogden Air Logistics Center, Hill AFB, Utah. Utah Propellant Lab Section.
PROPELLANT SURVEILLANCE REPORT LGM-30F AND G STAGE I PHASE B, SERIES 1TP-H1011 Semiannual Report
John A. Thompson Jan. 1975 176 p
(AD-A007036; MANCP-315(75)) Avail: NTIS CSCL 21/9

This report contains propellant test results from cartons of TP-H1011 bulk propellant representing LGM-30 F and G First Stage Minuteman Motors. This report uses a statistical approach to analyze the bulk carton propellant. An analysis of all parameters indicates that eight years of aging has not greatly affected the properties of the propellant. No potential problems are expected in the propellant for at least two years past the oldest data point. Each point on the regression plot represents all samples at that particular age. The number of samples at each point is indicated on the sample size summary sheet on the page accompanying each regression plot. The data range at any age can be found by suitable inquiry of the GO85 system. GRA

N75-22476# RAND Corp., Santa Monica, Calif.
A USAF ENERGY PROJECTION MODEL
W. D. Gosch and W. E. Mooz Nov. 1974 71 p refs
(Contract DAHC15-73-C-0181)
(AD-A006928; R-1553-ARPA) Avail: NTIS CSCL 21/4

This report discusses a computer model that can be used to project future energy needs for the Air Force based on force posture elements and operational activity. The model gives Air Force planners a rapid method of systematically comparing the energy impact of present and alternative programs, the effects of changed flying activities, and current and hypothetical weapon systems. GRA

N75-22477# Stevens Inst. of Tech., Hoboken, N.J. Dept. of Mechanical Engineering.
HYDROGEN AS A FUEL
Richard B. Cole, J. W. Hollenberg, R. S. Magee, R. F. McAlevy, III, and K. H. Weil 28 Feb. 1975 14 p ref
(Contracts N00014-75-C-0220; N00014-67-A-0202-0046; ARPA Order 2615)
(AD-A006984; ME-TR-75001) Avail: NTIS CSCL 21/4

A short summary is given of continuing efforts directed toward evaluating the performance and problems of hydrogen-fueled piston engines and gas turbines and toward investigating the

potential and problems of hydride and cryogenic storage of hydrogen. GRA

N75-22478# Southwest Research Inst., San Antonio, Tex. Dept. of Automotive Research.
TECHNOLOGICAL IMPROVEMENTS TO AUTOMOBILE FUEL CONSUMPTION. VOLUME 1: EXECUTIVE SUMMARY Final Research, Jun. 1973 - Jan. 1974
C. W. Coon Dec. 1974 14 p Prepared in cooperation with Environmental Protection Agency, Ann Arbor, Mich.
(Contract DOT-TSC-628)
(PB-238677/9; DOT-TSC-OST-74-39-1) Avail: NTIS HC $3.25 CSCL 21D

The design changes, which are recommended for the purpose of maximizing fuel economy, were derived after lengthy review against a series of constraints including regulatory requirements, technical feasibility, and cost effectiveness. Several possible technological improvements are identified, documented, and evaluated with respect to fuel economy. Results are reported as percentage improvement in fuel economy by comparison with 1973 model year vehicles. The effect of vehicle emission control systems is considered in the evaluation procedure. The most promising individual improvements are incorporated into three synthesized vehicle designs, and the projected fuel economy improvement for these vehicles is reported. GRA

N75-22479# Southwest Research Inst., San Antonio, Tex. Dept. of Automotive Research.
TECHNOLOGICAL IMPROVEMENTS TO AUTOMOBILE FUEL CONSUMPTION. VOLUME 2A: SECTIONS 1 THROUGH 23 Final Report, Jun. 1973 - Jan. 1974
C. W. Coon Dec. 1974 216 p Prepared in cooperation with Environmental Protection Agency, Ann Arbor, Mich.
(Contract DOT-TSC-628)
(PB-238678/7; DOT-TSC-OST-74-39-2BA) Avail: NTIS HC $7.25 CSCL 21D

The technological feasibility of reducing the fuel consumption of automobiles is investigated. Design changes recommended for the purpose of maximizing fuel economy are derived after a series of constraints including regulatory requirements, technical feasibility, and cost effectiveness are reviewed. GRA

N75-22480# Southwest Research Inst., San Antonio, Tex. Dept. of Automotive Research.
TECHNOLOGICAL IMPROVEMENTS TO AUTOMOBILE FUEL CONSUMPTION. VOLUME 2B: SECTIONS 24 AND 25 AND APPENDIXES A THROUGH I Final Report, Jun. 1973 - Jan. 1974
C.W. Coon Dec. 1974 178 p refs Prepared in cooperation with EPA, Ann Arbor, Mich.
(Contract DOT-TSC-628)
(PB-238679/5; DOT-TSC-OST-74-39-2B) Avail: NTIS CSCL 21D

The design changes, which are recommended for the purpose of maximizing fuel economy, have been derived after lengthy review against a series of constraints including regulatory requirements, technical feasibility, and cost effectiveness. Several possible technological improvements are identified, documented, and evaluated with respect to fuel economy. This volume covers the following: Summary of individual improvements; synthesis of designs for maximum fuel consumption reduction; list of references; bibliography; and various appendices. GRA

N75-22481# Little (Arthur D.), Inc., Cambridge, Mass.
A STUDY OF TECHNOLOGICAL IMPROVEMENTS IN AUTOMOTIVE FUEL CONSUMPTION. VOLUME 1: EXECUTIVE SUMMARY Final Report, Jun. 1973 - Jan. 1974
Donald A. Hurter Dec. 1974 52 p refs Prepared in cooperation with EPA, Ann Arbor, Mich.
(Contract DOT-TSC-627)
(PB-238693/6; DOT-TSC-OST-74-40-1) Avail: NTIS HC $4.25 HC also available from NTIS $23.00/set of 4 reports as PB-238692-SET CSCL 21D

Potential improvements in automobile fuel consumption based on innovative design and components. Standard and compact-size reference vehicles were selected, and a study of how power is used was conducted. Obvious technological innovations that would save on fuel consumption were identified and evaluated, and then screened against program constraints. Operation of reference vehicles equipped with innovative components or redesigned was computer simulated to predict fuel usage and performance. Techniques to measure fuel economy performance were also developed, and a statistical evaluation of published driving modes was performed. Author

N75-22482# Little (Arthur D.), Inc., Cambridge, Mass.
A STUDY OF TECHNOLOGICAL IMPROVEMENTS IN AUTOMOBILE FUEL CONSUMPTION. VOLUME 2: COMPREHENSIVE DISCUSSION Final Report, Jun. 1973 - Jan. 1974
Donald A. Hurter Dec. 1974 234 p refs Prepared in cooperation with EPA, Ann Arbor, Michigan
(Contract DOT-TSC-627)
(PB-238694/4; DOT-TSC-OST-74-40-2) Avail: NTIS HC $7.50 HC also available from NTIS $23.00/set of 4 reports as PB-238692-SET CSCL 21D

This volume is the main body of the report and provides a comprehensive discussion of each improvement option, the Government constraints, the synthesized vehicles and the possible fuel economy gains. The contents cover: Fuel economy versus governmental constraints, operating conditions, and user/market requirements; fuel economy technology; the synthesis and evaluation of alternative vehicle designs. GRA

N75-22483# Little (Arthur D.), Inc., Cambridge, Mass.
A STUDY OF TECHNOLOGICAL IMPROVEMENTS IN AUTOMOBILE FUEL CONSUMPTION. VOLUME 3A: APPENDIXES 1 - 111 Final Report, Jun. 1973 - Jan. 1974
Donald A. Hurter Dec. 1974 199 p Prepared in cooperation with EPA, Ann Arbor, Mich.
(Contract DOT-TSC-627)
(PB-238695/1; DOT-TSC-OST-74-40-2a) Avail: NTIS HC $7.00 HC also available from NTIS $23.00/set of 4 reports as PB-238692-SET CSCL 21D

The original data collected as part of a study to determine potential improvements in automobile fuel consumption based on innovative design and components are presented. The contents of this volume include: Summary of sources and types of data collected; characteristics of the composite car; responses from industry to findings of this study; and performance data on innovative devices. GRA

N75-22484# Little (Arthur D.), Inc., Cambridge, Mass.
A STUDY OF TECHNOLOGICAL IMPROVEMENTS IN AUTOMOBILE FUEL CONSUMPTION. VOLUME 3B: APPENDIXES 4 - 7 Final Report, Jun. 1973 - Jan. 1974
Donald A. Hurter Dec. 1974 227 p refs Prepared in cooperation with EPA, Ann Arbor, Mich.
(Contract DOT-OST-627)
(PB-238696/9; DOT-TSC-OST-74-40-3b) Avail: NTIS HC $7.50 HC also available from NTIS $23.00/set of 4 reports as PB-238692-SET CSCL 21D

Data on various fuel economy test procedures, exhaust emission test procedures and standards are reported, including a final letter report of ADL subcontractor and a bibliography. This report is part of a study conducted to determine potential improvements in automobile fuel consumption based on innovative design and components. GRA

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N75-22485*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
REPRODUCIBILITY OF LIQUID OXYGEN IMPACT TEST RESULTS
J. B. Gayle Washington May 1975 8 p ref
(NASA-TN-D-7905) Avail: NTIS HC $3.25 CSCL 20L

Results for 12,000 impacts on a wide range of materials were studied to determine the reproducibility of the liquid oxygen impact test method. Standard deviations representing the overall

variability of results were in close agreement with the expected values for a binomial process. This indicates that the major source of variability is due to the go - no go nature of the test method and that variations due to sampling and testing operations were not significant. Author

N75-22486*# Union Carbide Corp., Tonawanda, N.Y. Linde Div.
SURVEY STUDY OF THE EFFICIENCY AND ECONOMICS OF HYDROGEN LIQUEFACTION
8 Apr. 1975 158 p refs
(Contract NAS1-13395)
(NASA-CR-132631) Avail: NTIS HC $6.25 CSCL 20L

The production of liquid hydrogen, with coal as the starting material, is reported. The minimum practicable energy and cost for liquefaction of gaseous hydrogen in the 1985-2000 time period is presented to investigate the possible benefits of the integration of coal gasification processes with the liquefaction process. M.C.F.

N75-22487# Advisory Group for Aerospace Research and Development, Paris (France).
SPECIALISTS MEETING ON FRETTING IN AIRCRAFT SYSTEMS
Jan. 1975 229 p refs In ENGLISH; partly in FRENCH Presented at 39th Meeting of the Struct. and Mater. Panel, Munich, 6-12 Oct. 1974
(AGARD-CP-161) Avail: NTIS HC $7.50

The effects of fretting and wear on the reliability of aircraft structures and engines are examined. Various control surfaces are categorized in terms of their role in the maintenance of flight profile and structural integrity along with several typical fretting situations. The occurrence of fretting on the fan, compressor, and turbine blades of jet engines is examined to include the effects on splines, rolling elements, bearing races, and secondary sealing elements of face type seals. The sequence of events which constitute the fretting mechanism is analyzed. For individual titles, see N75-22488 through N75-22503.

N75-22488 Missouri Univ., Columbia. Coll. of Engineering.
FRETTING OF AIRCRAFT CONTROL SURFACES **c05**
David W. Hoeppner *In* AGARD Specialists Meeting of Fretting in Aircraft Systems Jan. 1975 9 p Sponsored in part by ONR (For availability see N75-22487 14-31)

The occurrence of fretting and fretting fatigue in aircraft structures and components is discussed. The terminology and general conditions which produce fretting are defined. The two major elements of the fretting process are identified as; (1) relative displacement between surfaces in contact and (2) a normal load acting upon the surfaces. The conditions which lead to an acceleration of fretting and wear are analyzed. Illustrations of fretting fatigue and damage to representative aircraft components are provided. Author

N75-22489 Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).
FRETTING OF STRUCTURES FOR MODERN VG FIGHTERS **c05**
Volker Vontein and Peter E. Seibert *In* AGARD Specialists Meeting on Fretting in Aircraft Systems Jan. 1975 15 p refs (For availability see N75-22487 14-31)

The fretting phenomenon of structures for fighter aircraft and practical countermeasures to reduce fretting are discussed. Fretting problems caused by wing pivots are examined. The layout and design of the pivot lugs and bearings to avoid fretting are shown. A description of a wing carry-through box for fretting reduction is included. Author

N75-22490 Westland Helicopters, Ltd., Yeovil (England).
FRETTING IN HELICOPTERS **c05**
J. R. Lee *In* AGARD Specialists Meeting on Fretting in Aircraft Systems Jan. 1975 10 p (For availability see N75-22487 14-31)

The fretting problem in helicopters which is created by the high frequency of alternating loads is discussed. Examples are given of some of the more common cases of fretting. The most serious effect of fretting is stated to be reduction in fatigue strength. Methods for alleviating fretting by clamping pressure to prevent relative movement, improved lubrication, soft low strength interlayers, and hard wear resistant coatings are proposed. The author states that in many cases the only method for eliminating or reducing fretting is to redesign the component. Author

N75-22491 United Aircraft Corp., Stratford, Conn. Sikorsky Aircraft.
FRETTING FATIGUE IN TITANIUM HELICOPTER COMPONENTS **c05**
M. J. Salkind *In* AGARD Specialists Meeting on Fretting in Aircraft Systems Jan. 1975 6 p refs (For availability see N75-22487 14-31)

An analysis of the effects of fretting on the fatigue strength of titanium components used in helicopters is presented. Methods for reducing the effects of fretting consist of cold working of contact surfaces, silver plating, solid lubricants, and sacrificial metallic liners. Electron micrographs of main fracture surface for typical components are shown. The need for full scale testing to establish fretting characteristics is stressed since there are no representative small specimen tests which duplicate the fretting mechanism and the parameters controlling it. Author

N75-22492# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FRETTING IN AIRCRAFT TURBINE ENGINES **c07**
Robert L. Johnson and Robert C. Bill *In* AGARD Specialists Meeting on Fretting in Aircraft Systems Jan. 1975 17 p refs Prepared in cooperation with Army Air Mobility R and D Lab., Cleveland (For availability see N75-22487 14-31)

The problems created by fretting in turbine engines are discussed. The areas of greatest wear identified with the fan, compressor, and turbine blade mountings being the most critical items. Various methods for reducing or eliminating fretting in a turbine engine are described. Vacuum deposition of coatings by sputtering and ion plating are recommended as an economic method of applying thin films to inhibit fretting. Author

N75-22493 Societe Nationale d'Etudes et de Construction de Moteurs Aeronautiques, Corbeil (France).
COMMENT ON WEAR OF NON-LUBRICATED PIECES IN TURBOMACHINES [COMMENT REDUIRE L'USURE DES PIECES NON LUBRIFIEES DANS LES TURBOMACHINES] **c07**
J. Thiery and R. Spinat *In* AGARD Specialists Meeting on Fretting in Aircraft Systems Jan. 1975 14 p In FRENCH; ENGLISH summary (For availability see N75-22487 14-31)

The parts of a turbojet engine which may be damaged by fretting are identified. Fretting wear is investigated on an alternate friction test rig, up to high temperatures, for various solid materials and a number of anti-wear skins. From the results obtained, behavior principles for materials and skins are derived and used as guidelines to solve the main wear problems encountered. Author

N75-22494 Rolls-Royce, Ltd., Leavesden (England). Small Engine Div.
THE INFLUENCE OF FRETTING ON FATIGUE **c37**
W. J. Harris *In* AGARD Specialists Meeting of Fretting in Aircraft Systems Jan. 1975 12 p refs (For availability see N75-22487 14-31)

The fretting fatigue phenomena for various metals are discussed. Methods for reducing fretting in aluminum alloys are described. The use of epoxy resin matrix films for fretting reduction is recommended. The use of tungsten carbide-cobalt coats to reduce fretting of titanium alloys is proposed. The results of tests conducted with various types of fretting reduction coatings are analyzed. Author

N75-22495 Nottingham Univ. (England). Dept. of Metallurgy and Materials Science.
PHYSICS AND METALLURGY OF FRETTING **c26**
R. B. Waterhouse *In* AGARD Specialists Meeting on Fretting in Aircraft Systems Jan. 1975 17 p refs Sponsored by Min. of Def. and Sci. Res. Council (For availability see N75-22487 14-31)

Fretting corrosion and fretting fatigue are concerned with the oscillatory tangential relative movement of two contacting

surfaces. In many contacts movement occurs over only part of the contact and fatigue cracks are frequently observed originating in the boundary between the slip and non-slip regions. Temperature rises in the contact zone can lead to thermoelectric effects between dissimilar metals but these are less important than metallurgical effects, particularly in heat-treatable materials. Work-hardened and age-hardened alloys are particularly susceptible to fretting damage. The volume of material affected by the stress system is of importance in fretting fatigue. Author

N75-22496 Metaalinstitut TNO, Apeldoorn (Netherlands).
SURFACE DISTRESS OF COPPER ALLOYS IN CONTACT WITH STEEL UNDER FRETTING CONDITIONS **c26**
A. Begelinger and A. W. J. DeGee *In* AGARD Specialists Meeting on Fretting in Aircraft Systems Jan. 1975 10 p refs (For availability see N75-22487 14-31)

Study of the fretting behavior of copper alloys against steel showed that, in the presence of a liquid lubricant, the wear process is purely adhesive by nature. Tests, performed under conditions of continuous lubricated sliding, show that such tests may be used to provide a first rough estimate of the behavior of materials under conditions of lubricated fretting, provided that the rate of energy production under sliding conditions equals that under fretting conditions. In the absence of a lubricant the process is determined exclusively by the formation and subsequent behavior of oxides on the steel surface. Now, tests performed under conditions of continuous sliding give no indication whatever of the behavior of materials under fretting conditions. Author

N75-22497 Dow Corning G. m. b. H., Munich (West Germany).
LUBRICATION UNDER EXTREME PRESSURE [LA LUBRIFICATION EXTREME-PRESSION] **c37**
Paul Deyber and Maurice Godet *In* AGARD Specialists Meeting on Fretting in Aircraft Systems Jan. 1975 13 p refs In FRENCH (For availability see N75-22487 14-31)

Hydrodynamic action, film formation, and film elimination were studied during mixed lubrication under extreme pressure. Limits and hydrodynamic range were established for lubrication of the solid specimen studied. The gradual build up of a solid lubricating layer resulting from an additive reaction with steel was described. Finally, the competition between the formation of a film by reaction products from the chemical oil additives and the wear was observed. Transl. by E.H.W.

N75-22498 Rensselaer Polytechnic Inst., Troy, N.Y. Mechanics Div.
DESIGN OF PIVOTS FOR MINIMUM FRETTING **c37**
M. B. Peterson and F. F. Ling *In* AGARD Specialists Meeting on Fretting in Aircraft Systems Jan. 1975 22 p refs (For availability see N75-22487 14-31)

An analytical and experimental investigation has been conducted on the fretting of pivots. A test rig was set up which allowed fretting studies to be conducted under a wide range of conditions of frequency, load, amplitude, temperature, time, materials and geometries. It was found that rolling contacts performed much more satisfactorily than sliding contacts because of limited microslip. Dynamic loads, gross sliding, and changing of the contact area increase fretting substantially. Open contact geometries are less damage prone than more restrictive ones. Materials like tool steels and carbides are effective over a wide range of conditions when the microslip is limited. Designs are based on those contacts which give microslips less than .00004 in. and pressures less than 220,000 psi since these performed satisfactorily under long term tests. Since, microslips can be calculated for any given materials and designs research is needed to determine microslip damage limits of various materials. In studying fretting, it is important to clearly understand the motions and the nature of the damage processes. Author

N75-22499 Hydromecanique et Frottement, Andrezieux (France). Centre Stephanois de Recherches Mecaniques.
NEW POSSIBILITIES OFFERED BY SURFACE TREATMENT IN CONTRAST TO CONTACT CORROSION [NOUVELLES POSSIBILITIES OFFERTES PAR LES TRAITEMENTS DE SURFACE DANS LA LUTTE CONTRE LA CORROSION DE CONTACT] **c05**
A. Gonin, A. Berger, and J. J. Caubet *In* AGARD Specialists Meeting on Fretting in Aircraft Systems Jan. 1975 16 p refs In FRENCH (For availability see N75-22487 14-31)

A number of surface treatments, including boriding, are proposed for eliminating or reducing contact corrosion in mechanical parts. Special coatings-plastics-and rough surfaces are examined as possible means of fretting control. Porous metals and etched metallic surfaces were also examined. Transl. by E.H.W.

N75-22500* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECT OF VARIOUS MATERIAL PROPERTIES ON THE ADHESIVE STAGE OF FRETTING **c37**
Donald H. Buckley *In* AGARD Specialists Meeting on Fretting in Aircraft Systems Jan. 1975 19 p refs (For availability see N75-22487 14-31)

Various properties of metals and alloys have been studied with respect to their effect on the initial stage of the fretting process, namely adhesion. Crystallographic orientation, crystal structure, interfacial binding energies of dissimiliar metal, segregation of alloy constituents and the nature and structure of surface films have all been found to influence adhesion. High atomic density, low surface energy grain orientations exhibit lower adhesion than other orientations. Hexagonal metals in general manifest less adhesive wear than cubic metal. Knowledge of interfacial surface binding energies can assist in predicting adhesive transfer and wear. Selective surface segregation of alloy constituents can accomplish both a reduction in adhesion and improved surface oxidation characteristics. Equivalent surface coverages of various adsorbed species indicate that some are markedly more effective in inhibiting adhesion than others. Author

N75-22501 Fiat S.p.A., Turin (Italy).
SELF-LUBRICATING POLYMERS **c27**
Alfredo Franceschini *In* AGARD Specialists Meeting on Fretting in Aircraft Systems Jan. 1975 17 p refs (For availability see N75-22487 14-31)

Some polymers, either of the thermoplastic or the thermosetting type, are quite suitable as self-lubricating materials. Such bearings are useful whenever lubrication is impossible or impractical for temperature, weight, corrosion or other limitations. The most commonly used plastics in this field are the polytetrafluoroethylene, the polyamides, the polyacetals and the phenolics; these have been joined recently by a family of heat resistant materials, the polyimides. The significant material properties in tribology, in absence of lubrication, are the friction coefficient and the wear rate; to these are connected - in a more or less direct way - other physico-mechanical properties: thermal conductivity, hardness, and thermal expansion. With regard to running conditions the prominent parameters are temperature, load and sliding velocity; if they become more severe conventional polymers fail, and one must resort to more specialized materials, like PTFE sintered with bronze and lead, or members of a relatively new group of polymers: the polyimides. Author

N75-22502 Air Force Materials Lab., Wright-Patterson AFB, Ohio.
FRETTING WEAR BEHAVIOR OF A POLYSILOXANE BONDED SOLID LUBRICANT **c37**
R. J. Benzing and B. D. McConnell *In* AGARD Specialists Meeting on Fretting in Aircraft Systems Jan. 1975 6 p refs (For availability see N75-22487 14-31)

The development and characteristics of a polysiloxane bonded solid lubricant are discussed. The application of the lubricant to titanium engine compressor units to reduce fretting is described. The chemical properties of the lubricant are analyzed. The test equipment and the method for conducting fretting tests are reported. Author

N75-22503 Chevron Research Co., Richmond, Calif.
FRETTING WEAR OF STEEL IN LUBRICATING OILS **c37**
Douglas Godfrey *In* AGARD Specialist Meeting on Fretting in Aircraft Systems Jan. 1975 7 p refs (For availability see N75-22487 14-31)

Fretting wear experiments were conducted to determine the properties of mineral oil which inhibit or promote wear. The apparatus used caused a steel bearing ball to vibrate in contact with a steel block. Large wear scars and alpha Fe2O3 were produced in a few minutes with unlubricated specimens. In the

presence of one drop of medicinal white oil or a commercial lubricant, very small wear scars were produced in one hour. Oxidation of the oils increased wear slightly. The addition of tetralin hydroperoxide also increased wear. The greatest wear was produced with a mixture of oxidized oil and fine alpha Fe2O3 powder. Author

N75-22504# European Space Research Organization, Paris (France).
LARGE STRUCTURES FOR MANNED SPACECRAFT: MATHEMATICAL ANALYSIS, DESIGN, CONSTRUCTION AND TESTS
Mar. 1974 618 p refs Partly in ENGLISH; partly in FRENCH Proc. of 3d Testing Symp., Frascati, Italy, 22-26 Oct. 1973 (ESRO-SP-99) Avail: NTIS HC $15.25

Results and findings on the various aspects relating to structural problems concerning large structures for manned spacecraft are presented. Selected studies are described in the fields of: (1) mathematical analysis (finite element methods, structure dynamic optimization, damping analysis, thermal distortion, NASTRAN analysis), (2) design (aircraft structural technology, reliability, low cost approaches, structural trade studies, reusable structures, mechanical properties of composite materials); (3) construction (machinery and tooling methods, bonding, jointing riveting, bolting, welding processes); and (4)tests (environmental fatigue, dynamic, mechanical, acoustic, and modal tests; nondestructive testing methods; data acquisition and processing techniques). For individual titles, see N75-22505 through N75-22545.

N75-22505 Aeritalia, Turin (Italy).
FINITE-ELEMENT METHOD APPLICATIONS IN THE DESIGN OF AEROSPACE STRUCTURES **c39**
P. Piantella *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 3-14 (For availability see N75-22504 14-31)

Procedures and techniques used by Aeritalia's structural departments in the design of aerospace structures, with the aid of high-speed digital computers, are presented with particular reference to the fields of static and dynamic structural analysis. The available finite-element computer programs, both those developed in house (such as AMSA in its MK9 and MK20 versions) and those available commercially (such as the NASTRAN), are discussed in connection with their application to aerospace structures such as rear fuselage of the VTOL aircraft VAK 191-B and Mercure twin-jet commercial aircraft. Among satellite structures, in addition to the finite-element models for the COS-B, GEOS, and Meteosat predevelopment phases, a model was established for the Sirio satellite. The NASTRAN program was applied to the design of tropospherical closure of a pressure vessel with four feed-through flanges. Possibilities offered by the finite-element programs for the structural analysis of the Spacelab module are outlined. ESRO

N75-22506 Liege Univ. (Belgium). Lab. des Techniques Aeronautiques et Spatiales.
RECENT PROGRESS IN THE ANALYSIS OF STRUCTURES USING THE FINITE ELEMENT METHOD [RECENTS PROGRES DANS L'ANALYSE DES STRUCTURES PAR LA METHODE DES ELEMENTS FINIS] **c39**
G. Sander *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 15-42 refs In FRENCH (For availability see N75-22504 14-31)

Main activities of the university in the field of structural analysis and continuous media analysis using the finite element method are reviewed, as well as difficulties encountered in application of the finite element method to the analysis of large dimension structures. Dual analysis principles, characteristics, and performances are discussed. Computer programs for dynamic analysis of structures are presented, and applications to some cases, including the static analysis of VFW 614 aircraft flaps, dynamic analysis of flutter conditions of thermal protection panel, and dynamic analysis of Eole structures, are discussed. ESRO

N75-22507 Dornier-System G.m.b.H., Friedrichshafen (West Germany).
STRUCTURAL DYNAMIC OPTIMISATION OF SATELLITES **c18**
H. Roehrle *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 43-52 refs (For availability see N75-22504 14-31)

A dynamic optimization method is presented which takes advantage of resonant conditions to reduce the elastic and damping structure to a minimum weight, or nearly minimum. The nodal geometry of the mathematical model, as well as the spring damping and payload arrangements, are assumed to be known. Maximum possible use is made of stresses, similar to the fully stressed design and of accelerations. The iteration is terminated as soon as all elastic elements have been subjected to maximum stress and each eigenmode has shown the maximum admissible acceleration in the case of resonance at the normalized maximum deflection. The theory described is applied to the longitudinal vibration mode of the AEROS satellite with eight degrees of freedom. Author (ESRO)

N75-22508 Ruhr Univ., Bochum (West Germany).
THE ANALYTICAL REPRESENTATION OF DAMPING IN THE DYNAMICS OF STRUCTURES **c18**
G. Schmid and H. Roehrle (Dornier System GmbH, Friedrichshafen, West Ger.) *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 53-64 refs Sponsored by Deut. Ges. fuer Weltraumforsch. (For availability see N75-22504 14-31)

The theory of the analysis of steady-state vibration due to harmonic excitation with three different methods of damping is illustrated. In addition how the mathematical model can be fitted to give results in agreement with experiment is shown. The restrictions connected with the three different methods are indicated. The different damping representations are applied to the AEROS satellite. The frequency dependence of the damping values, as shown for general viscous and structural damping, is not important when using model damping; this is automatically incorporated in the formulation using the eigenmode transformation. In contrast to this, the element-related formation of the damping matrix may be advantageous if local damping values, given in the design, are transferred directly to the mathematical model, and similarly in the feedback from the model to the design layout. ESRO

N75-22509 Engins Matra, Velizy (France).
ANALYSIS OF THERMAL DISTORTION OF LARGE SPACECRAFT ANTENNAS **c18**
H. Larsson *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 65-72 (For availability see N75-22504 14-31)

The ASKA program was used to analyze large three-dimensional sandwich structures. A focus-fed antenna of 1.75 m diameter and a 2.8 m diameter Cassegrainian antenna was treated with environmental and electrical (12 GHz) specifications representative of future television broadcast spacecraft, three-axis stabilized in a geostationary orbit. Some general conclusions are drawn for the design of the focus-fed antenna as well as for the use of large structure analysis programs. ESRO

N75-22510 Hawker Siddeley Dynamics Ltd., Stevenage (England).
STRUCTURAL ANALYSIS OF THE SPACELAB PALLET **c18**
J. K. Bennet and P. V. Lathwell *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 73-79 (For availability see N75-22504 14-31)

Techniques employed in the structure analysis of the spacelab Pallet are described, including initial design studies, payload enveloping, finite-element modelling, main load analysis, and fatigue analysis. A discussion on how structural analysis is used within the design function to achieve an overall optimum system including factors such as type of construction, analysis depth, safety factor philosophy, and test philosophy is contained. ESRO

N75-22511 Grumman Aerospace Corp., Bethpage, N.Y.
NASTRAN ANALYSIS OF THE 1/8 SCALE SPACE SHUTTLE DYNAMIC MODEL **c18**
M. Bernstein, P. W. Mason, J. Zalesak, D. Gregory, and A. Levy *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 81-128 refs (For availability see N75-22504 14-31)

The structural dynamic characteristics of the space shuttle configuration are discussed to show the effects of high modal density at low frequencies and the high degree of coupling between

latitudinal and longitudinal motions. An accurate analytical representation of these characteristics is a primary means for treating structural dynamic problems during the design phases of the shuttle program. A finite element model of the one-eighth scale dynamic model of the space shuttle was established. The finite element model was developed for the NASA Structural Analysis (NASTRAN) computer program. Experience with NASTRAN and various alterations to the formats are discussed.
Author (ESRO)

N75-22512 Marshall of Cambridge (Engineering) Ltd. (England).
THE APPLICATION AND DEVELOPMENT OF AIRCRAFT STRUCTURAL TECHNOLOGY (SAFETY ETC.) c05
N. A. J. Harry *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 131-166 (For availability see N75-22504 14-31)

Methods and techniques applicable to aircraft structural safety, reliability, and airworthiness, with particular reference to the Spacelab element of the Post-Apollo program, are described. Derivation of safety factors for static and dynamic loads, the fatigue-prediction and fatigue-monitoring procedures, are examined and developed. Design criteria are formulated and consideration is given to effects of thermal cycling. Methods of structural analysis to determine stress levels and structural deformation characteristics are described. Particular design problems are discussed with comments on the effects of jointing and construction methods. Internal structure and systems-installation effects on the primary structure are examined and recommendations given. Fail-safe applications and crack propagation are described. Structural-testing practices, the number of models and application of static dynamic and fatigue-testing methods are presented, together with recommendations on pressure testing. Fatigue-testing procedures, correlation with fatigue-monitoring program and fatigue life estimation are prescribed. Methods of handling and analyzing test data are defined. Finally, the application of statistical methods to failure analysis is briefly outlined. Author (ESRO)

N75-22513 Dornier-System G.m.b.H., Friedrichshafen (West Germany).
RELIABILITY OF SPACECRAFT STRUCTURES: RELIABILITY/SAFETY-FACTOR TRADE-OFF c18
K. Radimirsch *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 167-172 (For availability see N75-22504 14-31)

With the growing size of today's spacecraft structures, the importance of weight and cost reduction is increasing. The definition of conventional safety factors depends on cautious assumptions, causing overdimensioning and some doubts in structural design. By employing reliability methods, statistical data are utilized to produce realistic optimum results. Hence, for structure optimization, reliability-method practice is a very urgent requirement. Author (ESRO)

N75-22514 Lockheed Missiles and Space Co., Sunnyvale, Calif.
LOW-COST APPROACHES TO SPACELAB c18
R. M. Gray *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 173-189 refs (For availability see N75-22504 14-31)

The potential application of a low cost design approach to the elements of the Spacelab and the European unmanned space programs is discussed. The principal characteristics of future modularized spacecraft to be launched and serviced by the space shuttle, the potential standardization and operational methodology to be employed, and the impacts upon the space program in the 1980s are described. The discussion is presented in six parts: (1) modularized spacecraft and refurbishable component design, (2) standardization of space hardware, (3) new logistics of space maintainable spacecraft, (4) cost impacts on the space program, (5) applications to Spacelab, and (6) applicability to European unmanned spacecraft. Author (ESRO)

N75-22515* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
A DISCUSSION OF SORTIE LAB STRUCTURAL SUBSYSTEM TRADE STUDIES c18
R. W. Schock *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 191-198 (For availability see N75-22504 14-31)

The first trade study discussed is a structural sizing and resultant weight comparison between a 3.66 m diameter and a 3.94 m diameter pressurized shell. Results of this trade are presented, indicating the structural areas of weight reduction and growth. The orbiter payload support techniques are discussed, evaluating the advantages and disadvantages. A comparison of various techniques using the system is presented, along with resulting weight comparisons. A preliminary assessment of Sortie Lab natural frequencies and mode shapes is also presented and discussed. In conclusion, an assessment of the Sortie Lab weight related to structural design factor of safety and a discussion of a possible structural test program associated with increased design factors of safety is presented. Author (ESRO)

N75-22516 Boeing Co., Seattle, Wash.
APPLICATION OF AEROSPACE STRUCTURES TO LARGE MANNED SPACECRAFT c18
G. F. Riley and H. L. Schumann *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 199-219 (For availability see N75-22504 14-31)

An evolutionary approach was used in the design of some of today's large aerospace systems, such as the Saturn-5 launch vehicle and the Boeing 700-series airplanes. This design extension of proven systems minimizes the need for new technology and results in a highly reliable system at lowest program cost. Extension of the evolutionary approach from the manned rating of an airplane flying at 35,000 ft altitude to a manned spacecraft such as Spacelab could produce a substantial cost saving while maintaining space standard reliability. This is especially attractive since continuing emphasis will be given to achieving low cost systems for manned spacecraft.
Author (ESRO)

N75-22517 Contraves Corp., Zurich (Switzerland).
DESIGN/ANALYSIS APPROACH FOR THE SPACELAB PALLET STRUCTURE c18
K. J. Zimmermann *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 221-252 (For availability see N75-22504 14-31)

How a logical design procedure and design philosophy, applied consistently, led to a relatively unconventional solution, namely the so-called Box-Type Brick System is illustrated. The reasons for the preliminary choice of further concepts as well as their design and manufacturing costs, the influence of series production, and other quantitive and qualitative aspects, are given. The results of the value analysis applied to the selected concept is also presented. Furthermore, static and dynamic analysis with the NASTRAN program, and its results, are discussed. The description of the design background to the work carried out may provide an indication of the low effort (manhours) needed for the definition study, a special feature of European design techniques.
Author (ESRO)

N75-22518 Hawker Siddeley Dynamics Ltd., Stevenage (England).
THE DESIGN PHILOSOPHY OF A REUSABLE SPACE STRUCTURE c18
J. A. Dickinson *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 253-257 (For availability see N75-22504 14-31)

The philosophies used in the design of the Spacelab Pallet structure are highlighted. The Pallet has to provide a payload flexibility unique in space structures not only for individual flights but for re-use in potentially different modes. It is shown that the design philosophy is influenced by a background of aircraft and spacecraft design practices. Author (ESRO)

N75-22519 Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Stuttgart (West Germany). Inst. fuer Bauweisen- und Konstruktionsforschung.
MECHANICAL PROPERTIES OF COMPOSITE MATERIALS AND DESIGN CONCEPTS FOR COMPOSITE STRUCTURES c18
R. Kochendoerfer, G. Grueninger, and K. Stellbrink *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 259-281 refs (For availability see N75-22504 14-31)

The payload to gross weight ratio of Spacelab is low. An attractive means of saving weight is to use fiber-reinforced materials in the structure. The mechanical properties of composites are considered, together with existing successful applications of these materials in aircraft structures for a multitude of flight-tested components. Some peculiarities to be taken into account in the

design of structural elements when using composite materials are discussed. Author (ESRO)

N75-22520 Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany).
SOME ACTIVITIES CONCERNING THE APPLICATION OF COMPOSITE MATERIALS TO STRUCTURAL COMPONENTS OF SPACECRAFT c18
R. Zimmermann *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 283-291 refs (For availability see N75-22504 14-31)

Some activities in the field of composite materials are discussed. Preliminary results of a research program involving filament-wound high-strength internal pressure vessels are given. The experimentally determined performance values indicate the possibility of obtaining remarkably small variation coefficients. Further points discussed include sandwich construction and lightweight harness buckles. Author (ESRO)

N75-22521 Battelle Inst., Frankfurt am Main (West Germany).
FIBER-REINFORCED LIGHT METALS: RESULTS OF DEVELOPMENT WORK. FUTURE TRENDS AND COMPARISON WITH OTHER MATERIALS c18
J. Nixdorf and G. Weisser *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 293-311 refs (For availability see N75-22504 14-31)

Particular design problems of large, lightweight, pressurized structures; the relative advantages and disadvantages of different materials; and joining techniques, their relative advantages and disadvantages, are discussed. Fiber-reinforced aluminum for use in space vehicles is produced using a hot pressure welding technique. The various aluminum alloys are reinforced by incorporating boron filaments, steel wires, and, above all, carbon fibers. The strength properties, particularly at elevated temperature, are outstanding. Some experience in the joining of fiber-reinforced composites is reported. Author (ESRO)

N75-22522 Aeritalia, Turin (Italy).
MANUFACTURE OF LARGE MANNED AEROSPACE STRUCTURES c18
F. Livi and R. Vietto *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 315-340 (For availability see N75-22504 14-31)

Activities of Fiat in the aerospace field are reported. They include manufacturing of military aircraft such as G 91, VAK 191B, G 91Y, MRCA, military transport aircraft G 222, Breguet Atlantic components, and the Mercure airplane central and rear fuselage and tail structure. The Turin plants are equipped for the development and production of wide-body aerospace structures manufactured in machining shop, sheet-metal-forming shop, chemical-milling shop, welding shop, bonding shop, surface-treatment shop, and final assembly shop. ESRO

N75-22523 Dornier-System G.m.b.H., Friedrichshafen (West Germany).
DIFFUSION BONDING FOR VACUUM-TIGHT STRUCTURES c18
H. Stockburger, E. vanRensen, and K. Gerber *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 341-348 (For availability see N75-22504 14-31)

The advantages of diffusion bonding over other bonding methods are discussed. Some bonding tests on materials of the type used in spacecraft, such as aluminum, titanium, and steel alloys, are presented. It is shown that, on the basis of the investigations performed, further investigations are necessary and must be carried out in the field of nondestructive testing. Furthermore, to improve the economics it is suggested that Europe should develop diffusion-bonding methods for use outside vacuum furnaces. ESRO

N75-22524 McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
FRACTURE CONTROL OF WELDED PRESSURIZED STRUCTURES FOR MANNED SPACEFLIGHT c18
R. A. Rawe *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 349-260 refs (For availability see N75-22504 14-31)

The need for a fracture-control system is demonstrated by past failures of spacecraft structures. Sources and types of defects that can result in premature failures are listed, with emphasis on weld-joint defects and countermeasures for lack of penetration. An analysis of the growth of part-through cracks, related to leak-before-burst design, is presented with an illustrative example. A shortcoming in the cyclic-life analysis of proof-tested, thin-wall structures containing very short cracks is indicated. Author (ESRO)

N75-22525 Royal Netherlands Aircraft Factories Fokker, Amsterdam.
APPLICATION OF SANDWICH CONSTRUCTIONS IN MANNED SPACECRAFT c18
M. P. Nieuwenhuizen *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 361-372 refs (For availability see N75-22504 14-31)

The advantages of using sandwich structures are presented. Some problems which have arisen in the past are reported as well as new improvements. Some principles for the prevention of fatigue in manned and unmanned spacecraft are outlined. An inspection method using a holographic test setup is described as well as the inspection method used. ESRO

N75-22526 Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).
THOUGHTS ON MATERIALS AND SERVICE LIFE FOR A REUSABLE SPACECRAFT c18
K. O. Sippel and D. Weisgerber *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 373-383 refs (For availability see N75-22504 14-31)

Some materials currently used for the high-temperature structures of reusable spacecraft are described. It is, however, pointed out that such external structures are not identical to the remainder of the stressed structure, which is not subjected to high temperatures and can therefore be manufactured from current aircraft materials. It is demonstrated how the materials can be selected and which criteria have to be observed. Attention is drawn to the fact that assessment of the various material characteristics is dependent on the mission spectrum of the spacecraft. A graph is then used to explain the effects that have to be taken into account in fatigue considerations and from a fracture-mechanics point of view, and the method to be employed for service-life and crack-propagation calculations. Results of similar material or service-life studies are illustrated in relation to Spacelab's Command Support System. Author (ESRO)

N75-22527 Industrieanlagen-Betriebsgesellschaft m.b.H., Ottobrunn (West Germany).
STRUCTURAL TEST PRINCIPLES FOR FULL SCALE AIRFRAMES AND THEIR APPLICATION TO THE SPACELAB TESTS c05
G. Bayerdoerfer *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 387-394 refs (For availability see N75-22504 14-31)

In the development of aircraft structures, a number of tests have become a more or less standard part of the test program. These tests are carried out in order to ensure the integrity of the airframe with respect to stiffness, static strength, dynamic behavior, and fatigue properties. The test specimens used for these tests are well defined and clearly separated. Author (ESRO)

N75-22528 Societe de Production et de Developpement Radio-Electrique, Paris (France).
A FULLY COMPUTERIZED SYSTEM FOR DETERMINING MATHEMATICAL MODELS OF STRUCTURES c39
J. A. Baticle *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 395-397 (For availability see N75-22504 14-31)

Mathematical models of mechanical structures are verified experimentally by analyzing their response to a forced harmonic excitation by means of a fully computerized system. The appearance of a new generation of structures, either in the aerospace field or in general mechanical industries with a high level of competition, involves the use of such systems. The system described is designed such that its power and capacity may be extended whenever the need arises. Author (ESRO)

N75-22529 Societe de Production et de Developpement Radio-Electrique, Paris (France).
NEW COMPUTERIZED EQUIPMENT FOR EXPERIMENTAL DETERMINATION OF DYNAMIC CHARACTERISTICS OF STRUCTURES **c39**
J. Perruchot *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 398-402 (For availability see N75-22504 14-31)

The procedures used for the experimental determination of the dynamic characteristics of structures are discussed. The determination of the modal scheme of aerospace structures by means of the global harmonic vibration test is analyzed to show advantages over the purely theoretical or mixed process. The methods applied for this type of structural analysis when using a mini-computer and specialized software, as well as the overall system, are reported. Improvements in the process are suggested. Author

N75-22530 Aeritalia, Turin (Italy).
SURVEY OF AERITALIA'S ACTIVITIES IN THE AEROSPACE FIELD **c14**
P. M. Massa *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 403-427 refs (For availability see N75-22504 14-31)

The significant experimental activities conducted by the Aeritalia Research Facilities in Turin, Italy are discussed. The criteria followed in planning test equipment, as well as the requirements for the results that the experiments were to furnish, are analyzed, together with the general operating principles of the installations used. The static test of the G222 transport aircraft, the static test of the SIRIO satellite, the fatigue test of the G 91Y fighter aircraft, and the radiation test of the ELDO vector heat shields are described. Author (ESRO)

N75-22531 Lockheed Missiles and Space Co., Sunnyvale, Calif.
STRUCTURAL DYNAMIC TESTING CONSIDERATIONS FOR LARGE SPACE VEHICLES **c14**
R. J. Herzberg *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 429-439 (For availability see N75-22504 14-31)

The transition from the design and manufacture of relatively small satellites in the 100-300 kg range to large satellites weighing above 10,000 kg has been made. The structural dynamic testing program for the large vehicles differs significantly from those used successfully for the smaller spacecraft. Experiences in this area are discussed in survey format. The more significant differences, such as acoustic test philosophy and modal testing, are emphasized. Author (ESRO)

N75-22532 Erno Raumfahrttechnik G.m.b.H., Bremen (West Germany).
PREDICTION OF HIGH-FREQUENCY VIBRO-ACOUSTIC ENVIRONMENT BY STATISTICAL ENERGY ANALYSIS **c18**
H. G. Maager *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 441-446 refs (For availability see N75-22504 14-31)

General aspects of a statistical energy analysis are outlined and the application of this approach on the structural development of the Spacelab is discussed with respect to: (1) the prediction of the high-frequency random vibration levels and internal noise levels throughout the Spacelab structure, which are exited in-flight by external pressure fluctuations and by the mechanical vibration of the shuttle's engines, (2) the effect of different Spacelab structure configurations on these environments; and (3) the evaluation of realistic acoustic and random vibration test conditions. Author (ESRO)

N75-22533 Societe Europeene d'Etudes et d'Essais d'Environnement, Buc (France).
ACOUSTICAL ENVIRONMENT OF SPACE VEHICLES AND MEANS FOR GROUND SIMULATION [L'ENVIRONNEMENT ACOUSTIQUE DES ENGINS SPATIAUX ET LES MOYENS DE SA SIMULATION AU SOL] **c14**
J. E. Gilly *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 447-466 refs In FRENCH (For availability see N75-22504 14-31)

The acoustic environments to which aerospace vehicles are subjected during atmospheric reentry or achieved on the ground during reentry using progressive wave tunnels or reflection chambers are defined. It is shown that knowledge of the spectral density of acoustic pressure and of the correlation laws is essential. The equivalence between the real environments and simulated environments is emphasized. ESRO

N75-22534 British Aircraft Corp. (Operating) Ltd., Bristol (England).
MECHANICAL VERSUS ACOUSTIC VIBRATION TESTING **c14**
M. L. Abrahams *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 467-474 refs (For availability see N75-22504 14-31)

In view of the many conflicting opinions expressed throughout Europe on the relative merits and otherwise of acoustic versus random vibration testing of spacecraft structures, an attempt is made to draw a rationalized comparison between the two techniques and to offer suggestions for the more efficient utilization of both forms of testing in future projects. A test facility combining both acoustic and vibration tests is suggested as the most suitable facility for analysis of aerospace structures. Author (ESRO)

N75-22535 Commissariat a l'Energie Atomique, Le Barp (France). Centre d'Etudes Scientifiques et Techniques d'Aquitaine.
DESCRIPTION OF ENVIRONMENTAL TEST FACILITY COMBINING THE CENTRIFUGATION AND VIBRATION [DESCRIPTION D'UN ESSAI D'ENVIRONNEMENT COMBINE CENTRIFUGATION ET VIBRATION] **c14**
D. LeLuhandre *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 475-484 In FRENCH (For availability see N75-22504 14-31)

A test combining the vibration excitation and the slightly variable accelerations was achieved to simulate the environments encountered by a space vehicle during atmospheric reentry. The method and equipment used as well as the performance of the test facility are described. Improvements to compensate the centrifugal stresses on the excitator module are discussed. ESRO

N75-22536 Erno Raumfahrttechnik G.m.b.H., Bremen (West Germany).
PRACTICAL APPLICATION OF FRACTURE MECHANICS FOR JUDGEMENT OF THE SPACELAB MODULE STRUCTURE **c39**
J. Walter *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 489-495 refs (For availability see N75-22504 14-31)

The application of fracture mechanics to thin-walled metallic structures, especially for internally pressurized structures in the presence of small defects (inclusions, surface flaws, embedded flaws, etc.) is demonstrated. The brittle fracture behavior below yield stress due to sustained load stresses (environments, stress-corrosion cracking) and cyclic stresses is shown and the leak-before-burst criterion explained. Computation methods for obtaining critical flaw sizes from experimental specimen data and tolerable flaw sizes, as well as the necessary nondestructive detection methods, are discussed. Author (ESRO)

N75-22537 Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
ONERA (MODANE AND PALAISEAU) MEANS FOR ACHIEVING THE TESTS ON LARGE SIZE AEROSPACE STRUCTURES [LES MOYENS DES CENTRES ONERA DE MODANE ET PALAISEAU UTILISABLES POUR DES ESSAIS DE STRUCTURES SPATIALES DE GRANDES DIMENSIONS] **c14**
J. Laverre and J. Vaillant *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 497-509 refs In FRENCH (For availability see N75-22504 14-31)

Test facilities for simulation of aerospace structures are described. They include: the S4MA hypersonic wind tunnel equipped with a 6 Mach nozzle of 0.686 m diameter- the S3MA supersonic wind tunnel, achieving velocities from M equals 3.4 to 4.5, and testing performance free-fall scale models; and, the S4B vacuum chamber of 2.5 m diameter, 109 cu m volume achieving high vacuum to 74 mm pressure. Data acquisition and data processing equipment used are detailed. The Palaiseau Center, equipped with two vacuum chamber (A-611 and A-612) and two aerospace simulators (B.61 and B.63), achieving simulated altitudes from 80 to 500 km are presented. ESRO

N75-22538 Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
DYNAMIC CHARACTERISTICS OF STRUCTURES DETERMINED USING POINT EXCITATION VIBRATION TESTING [DETERMINATION DES CARACTERISTIQUES DYNAMIQUES D'UNE STRUCTURE A PARTIR D'UN ESSAI DE VIBRATIONS AVEC EXCITATION PONCTUELLE] c39
R. Dat *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 511-518 refs In FRENCH (For availability see N75-22504 14-31)
Avail: NTIS

A method is described which allows the determination of transfer function from a vibration test carried out using a single excitation force. This method is based on the theory of discrete linear systems and uses the least squares smoothing program in order to determine the parameter which best fits the measured transfer functions. The parameters defining the matrix of the transfer functions are obtained using the finite element method. ESRO

N75-22539 Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany).
A SEMI-AUTOMATIC MODAL-SURVEY TEST TECHNIQUE FOR COMPLEX AIRCRAFT AND SPACECRAFT STRUCTURES c05
E. Breitbach *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 519-528 refs (For availability see N75-22504 14-31)

An improved test technique for determining the normal modes, normal frequencies, generalized masses, and generalized damping coefficients of complex structures are dealt with. It is shown how the normal modes can be isolated using a semi-automatic computer-controlled multipoint harmonic excitation. New procedures for measuring the coupled generalized damping matrix and the generalized masses by means of electronically simulated additional masses or stiffnesses are described. A control method for checking the orthogonality of the measured normal modes is presented. Author (ESRO)

N75-22540 Societe pour le Perfectionnement des Materiels et Equipements Aerospatiaux, Velizy-Villacoublay (France).
MOBILE SOPEMEA VIBRATION TEST FACILITY FOR THE EXPERIMENTAL DETERMINATION OF NORMAL MODES OF COMPLEX STRUCTURES [INSTALLATION MOBILE D'ESSAIS AUX VIBRATIONS DE LA SOPEMEA POUR LA DETERMINATION EXPERIMENTALE DES MODES PROPRES DES STRUCTURES COMPLEXES] c14
M. Porta *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 529-542 In FRENCH (For availability see N75-22504 14-31)

A test facility for determination of normal modes to predict the dynamic behavior of structures submitted to real environments is described. The installation includes an excitation assembly, a measurement assembly (piezoelectric accelerometers, phasemeters), and an automatic data acquisition and processing assembly. The different steps of the modal test are: vibration mode detection by logarithmic frequency sweep, adaptation of excitation forces to the mode under study, and the computation of generalized mass and damping. The performance, characteristics, and future prospects of such a system are discussed. ESRO

N75-22541 Societe pour le Perfectionnement des Materiels et Equipements Aerospatiaux, Velizy-Villacoublay (France).
MECHANICAL TEST MEANS FOR DANGEROUS SPECIMENS [LES MOYENS D'ESSAIS MECANIQUES POUR SPECIMENS DANGEREUX] c14
J. Y. Canihac *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 543-549 In FRENCH (For availability see N75-22504 14-31)

The activities of the company are introduced, and test facilities to control dangerous systems such as explosives, solid propellants, and high pressure reservoirs are reviewed. These include mainly environmental tests, such as mechanical tests (vibration, centrifugation, shocks) and climatological tests (humidity, vacuum, thermal shock, corrosion). Characteristics of equipment are presented as well as means to determine the precision of measurements. ESRO

N75-22542 Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Porz (West Germany).
FATIGUE TESTS IN VACUUM AT DIFFERENT TEMPERATURES c14
M. Boehmer and D. Munz *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 551-556 refs (For availability see N75-22504 14-31)

Two fatigue-testing machines for tests between 760 and 5 X 10 to the minus 8th torr to predict the life of a structure in a space environment are described: one for tests between room temperature and about 900 C and the other for tests between room temperature and minus-196 C. Some results obtained with an aluminum-3% magnesium alloy are reported. ESRO

N75-22543 Battelle Inst., Frankfurt am Main (West Germany).
ACOUSTIC EMISSION: A NEW NONDESTRUCTIVE TESTING METHOD FOR HIGHLY RELIABLE STRUCTURES c39
J. Becht and J. Eisenblaetter *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 557-569 refs (For availability see N75-22504 14-31)

Basic principles of acoustic emission (or stress-wave emission), a nondestructive testing method for detecting defects (such as cracks) and deformations in materials and structures, are reviewed as well as peculiarities, advantages, and disadvantages of this method when compared to other nondestructive testing methods. Numerous fields of application of acoustic emission are described. They include plastic deformation of ferrous and nonferrous metals, crack formation during stress-relief annealing, crack formation during cyclic loading, control of welding processes, stree-corrosion cracking, and finally, microcrack formation in various fiber-reinforced composite materials. ESRO

N75-22544 Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany).
COMPUTATIONAL TOOLS AND EXPERIMENTAL FACILITIES FOR SHELL BUCKLING AND FATIGUE INVESTIGATIONS c39
B. Geier *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 571-580 refs (For availability see N75-22504 14-31)

Programs for computing the buckling and vibration characteristics of shells are described and some indications are given of the underlying theory in order to explain the scope of their applicability. Attention is drawn to some equipment for mechanical and thermal testing of structures. Various practical applications were studied, such as calculation of buckling loads for orthotropic circular cylindrical shells subjected to combined longitudinal and radial loads. The Spacelab structure seems to be well within the scope of these structures. ESRO

N75-22545 Commissariat a l'Energie Atomique, Le Barp (France). Centre d'Etudes Scientifiques et Techniques d'Aquitaine.
ACQUISITION AND DIGITAL PROCESSING OF ENVIRONMENTAL DATA [ACQUISITION ET TRAITEMENT NUMERIQUE DE DONNEES D'ENVIRONNEMENT] c39
J. M. Bouquin *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 581-602 refs In FRENCH (For availability see N75-22504 14-31)

The environmental data processed include time variable signals measured on structures subjected to vibrational environments. The data processing consists of two phases: the acquisition phase and the analysis phase. Three types of signal are considered: sinusoidal signals, random signals, and transient signals. Acquisition methods for these signals are presented as well as digital analysis methods which include the digital filtering technique and the Fast Fourier Transformation technique. ESRO

N75-22546# Laboratoire de Recherches Balistiques et Aerodynamiques, Vernon (France). Service Aerodynamique.
PRESSURE RISE IN THE R4 VACUUM CHAMBER [MONTEE EN PRESSION DU CAISSON A VIDE DE R4]
F. Kauba and A. Desgardin 28 Nov. 1974 40 p refs In FRENCH
(Contract SNIAS-3359-3013)
(LRBA-E-1024-PV-14/SAE) Avail: NTIS HC $3.75

The tests performed at low ambient pressure in the vacuum chamber are described to study the pressure rise due to cold

air injection under varying flux conditions. Initial pressures were at 0.2 and 0.3 torr; cold air fluxes varied between 50 and 300 g/s. Two chamber volumes were considered at 65 and 300 cubic meters. The influence of initial ambient pressure, injection flux, and total chamber volume on the initial phase of the pressure rise curve is discussed. A suction trump effect always appears around one torr and delays considerably the pressure rise. ESRO

N75-22547# Nederlands Scheeps-Studiecentrum TNO, Delft. Scheepsbouw Afdeling.
THE BEHAVIOUR OF A SHIP IN HEAD WAVES AT RESTRICTED WATER DEPTHS
J. P. Hooft (Neth. Ship Model Basin) Aug. 1974 31 p refs (Rept-188-S; TDCK-65207) Avail: NTIS HC $3.75; Ned. Scheepsstudiecentrum TNO, Delft Dfl. 10

Tests with ship models sailing in head waves at restricted water depths of 1.875, 2.5, and 3.75 times the ship's draft are discussed. Squat and trim of ships in still water are dealt with, and equations of motion of ships in waves are given. Hydrodynamic coefficients of the ship and wave-excited forces on the ship were calculated. Motions of a ship in restricted water depth are discussed. Motion equations of a ship sailing at restricted water depths and thrust and power measurements are annexed. ESRO

N75-22548# Nederlands Scheeps-Studiecentrum TNO, Delft. Scheepsbouw Afdeling.
ACOUSTICAL EFFECTS OF MECHANICAL SHORT-CIRCUITS BETWEEN A FLOATING FLOOR AND A STEEL DECK
J. Buiten and J. W. Verheij (Tech. Phys. Dienst TNO-TH) Sep. 1974 12 p refs
(Rept-199-S; TDCK-65702) Avail: NTIS HC $3.25; Ned. Scheepsstudiecentrum TNO, Delft Dfl. 10

The influences of some common methods of installing a watertight connection between a floating asphaltic floor and a steel deck on the sound insulating properties have been investigated. The measurements show that the application of a layer of self-adhesive foam plastic or a layer of butyl filler between deck and asphalt is much more favorable than a solid strip of asphalt. Author (ESRO)

N75-22549# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
STORAGE AND TRANSPORTATION OF CHEMICAL PRODUCTS
M. I. Berezhkovskii 23 Dec. 1974 400 p refs Transl. into ENGLISH of the book "Khranenie i Transportirovanie Khimicheskikh Produktov" USSR, 1973 p 1-272
(AD-A006729; FTD-HC-23-1721-74) Avail: NTIS CSCL 07/1

The book is an attempt to present the basic considerations for safety in planning and using storage facilities for acids, alkalis, flammable and combustible liquids, liquid gases, highly toxic liquids and neutral substances. GRA

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking*.

N75-22550 University of Southern Calif., Los Angeles.
GENERALIZED INPUT BROADCAST CHANNELS Ph.D. Thesis
Richard Worthington Douglas Booth 1975 155 p
Avail: Univ. Microfilms Order No. 75-6400

The concept of a generalized input broadcast channel is introduced. The generalized input broadcast channel consists of two or more single input single output channels with a correlation requirement on the symbols to be simultaneously transmitted over each of the component channels. Two easily recognizable special cases exist, one is the broadcast channel where the same symbol is transmitted on each of the component channels and the independent inputs channel where the symbols transmitted on each of the component channels are independent. Other correlation requirements fall somewhere in between these two special cases. The example of a pair of BSCs with a particular symmetric input correlation was investigated. The random coding theorem needed for the generalized input broadcast channel is based on a random coding theorem developed for arbitrary broadcast channels. This random coding theorem for arbitrary broadcast channels is derived from a coding theorem for multiple access channels. Two example broadcast channels are investigated. Dissert. Abstr.

N75-22551 Case Western Reserve Univ., Cleveland, Ohio.
LINEAR PREDICTIVE SPEECH COMPRESSION SYSTEM AND ITS EVALUATION Ph.D. Thesis
Satish Chandre 1974 232 p
Avail: Univ. Microfilms Order No. 75-5055

The application of linear prediction theory to the analysis and synthesis of the speech waveform is reported. There are basically two linear prediction formulations: (1) stationary, and (2) nonstationary. Both the formulations are investigated experimentally, as a tool for speech analysis, in detail and the theoretical differences between the two are discussed. The application of linear prediction to formant analysis and speech spectrum estimation is carefully examined. Specific issues discussed include the adequacy of an all-pole model for formant extraction, influence of a zero of speech production transfer function on estimated formant parameters, pitch-synchronous and pitch-asynchronous analyses, unvoiced speech spectrum estimation, and influence of additive noise on the estimation process. Dissert. Abstr.

N75-22552 Wisconsin Univ., Madison.
PROPAGATION OF RADIO WAVES IN THE ANTARCTIC ICE SHEET Ph.D. Thesis
John Wendell Klough 1974 130 p
Avail: Univ. Microfilms Order No. 74-30097

Reflections from layers within the ice sheet of Antarctica and Greenland are frequently found on radio echo sounding records. The origin of these internal layers has been attributed to density variations, dirt layers, and changes in crystal orientation. Density variations appear to be the most likely cause of most internal layering and good correlation between reflector depth and density variations was obtained at Byrd Station, Antarctica. Wide-angle reflection measurements are used to obtain the velocity of propagation in the ice. The curvature of the ray path due to the density gradient near the surface produces negligible errors in the method but the lateral wave present at large ranges can produce errors if not accounted for. Dissert. Abstr.

N75-22553 Polish Academy of Sciences, Warsaw.
AUTOMATIC RECOGNITION OF LANGUAGE IN VOICE COMMUNICATION: ELECTRONIC DIGITAL MACHINES [AUTOMATYCZNE ROZPOZNAWNIE MOWY W KOMUNIKACJI CZLOWIEKA: ELEKTRONICZNA MASZYNA CYFROWA]
Ryszard Bubrynowicz 1974 27 p refs In POLISH
Avail: Issuing Activity

The usage of language signals for information transmission in man-machine systems, beginning with all the information entering the computer, is discussed. The advantages and operational problems of a computer which receives encoded information in the form of language signals are discussed along with the possibilities of using this type of input in data processing systems. Other topics discussed include programming languages, models for recognition of sematic information carried through a language signal, classification of phonemes and segments, and sematic interpretation. Transl. by M.J.S.

N75-22554 North Carolina State Univ., Raleigh.
AN EXPERIMENTAL AND THEORETICAL INVESTIGATION OF BEAM WAVEGUIDES AT MILLIMETER WAVELENGTHS Ph.D. Thesis
Janaki Ram Potukuchi 1974 160 p
Avail: Univ. Microfilms Order No. 75-7711

An experimental and theoretical investigation of wave propagation in a reflecting beam waveguide with two parallel concave reflectors is described. It is shown that the transverse

field distribution, for conditions typical of practical applications at millimeter wavelengths, can be represented by that in conventional elliptic waveguides. A unique advantage of this approach is that it is applicable to both confocal and nonconfocal beam waveguides. Special numerical methods used in the theoretical analysis were described and the final results presented include the cutoff wavelengths, the field configurations, and the approximate attenuation constants of TE and TM modes. An experimental investigation was carried out an a beam-guide resonator with two parallel cylindrical reflectors in both confocal and nonconfocal configurations. Dissert. Abstr.

N75-22555 California Univ., Los Angeles.
FINITE ELEMENT ANALYSIS OF THE PIEZOELECTRIC TOPOGRAPHIC WAVEGUIDE Ph.D. Thesis
William Anthony Oliver 1974 128 p
Avail: Univ. Microfilms Order No. 75-9423

The finite element method has been applied to the solution of electroelastic wave propagation in totally anisotropic piezoelectric media. This approximate method of numerical analysis involved the discretization of the body into triangular elements small enough to allow the assumption of a linear variation of the elastic displacements and electric potential within the element. A variational principle was then employed which lead to a system of equilibrium equations for the unknowns. Hamilton's principle was then applied to the sum contribution of all the elements to yield the matrix eigenvalue problem for the eigenfrequencies of the system. The triangular topographic waveguide with height-to-width ratio of 0.8 was analyzed in view of its anticipated low dispersion and strong guidance characteristics. Dissert. Abstr.

N75-22556 Ohio State Univ., Columbus.
OPTIMUM SAMPLING OF THE NEAR FIELD FOR THE PREDICTION OF ANTENNA PATTERNS Ph.D. Thesis
Bello Emmanuel Ojeba 1974 140 p
Avail: Univ. Microfilms Order No. 75-11409

A method is presented for the determination of the maximum modal spectral band-limits for cylindrical and spherical wave functions in the radiated field. This development is based on the Dyadic Green's function of free space expressed in the corresponding vector wave functions. An expression is obtained for the wave expansion coefficients for an arbitrary source. An upper limit depending on the maximum radial extent of the source is derived for these coefficients for sources which are square integrable with respect to spacial distributions. The resulting expression for the contribution of each field harmonic to the radiated field is found to be broad banded very close to the source surface. With radial distance from the source, free space attenuates the higher modes so the maximum spectrum becomes bandlimited. The band-limits are found to approach ka in the radiative fields, particularly for very large antennas.
Dissert. Abstr.

N75-22557 Ohio State Univ., Columbus.
ANALYSIS OF STRIP ANTENNAS IN THE PRESENCE OF A DIELECTRIC INHOMOGENEITY Ph.D. Thesis
Edward Howard Newman 1974 68 p
Avail: Univ. Microfilms Order No. 75-11404

Three moment method solutions are considered for treating the problem of wire antennas in the presence of an arbitrary dielectric inhomogeneity. In the first method, the current on the wire and the electric field intensity in the inhomogeneity are treated as independent unknowns, while in the second and third methods they are treated as dependent unknowns. The third method is applied to the problem of strip antennas in an electrically thin dielectric slab. Numerical results are presented, and are in good agreement with measurements and previous calculations.
Dissert. Abstr.

N75-22558 Pennsylvania State Univ., University Park.
DIFFERENTIAL PHASE VOLUME MODEL AND AMPLITUDE MEASUREMENTS OF PARTIAL REFLECTIONS Ph.D. Thesis
David B. Newman, Jr. 1974 193 p
Avail: Univ. Microfilms Order No. 75-9817

A theoretical model is presented of the differential phase experiment which accounts for scattering from a volume of irregularities. The expected value of the phase difference angle between ordinary and extraordinary mode partially reflected radio waves is derived and computer simulated data from several electron number density profiles are presented. The effect of the transmitter pulse length is clearly indicated and limitations of the theory in terms of probing frequency are discussed. An extensive effort was undertaken to investigate the nature of scattering of signals from the D-region. Numerous recordings of amplitude data were made, and the resulting data analysis shows that the amplitudes of partially reflected echoes obey a Rayleigh probability density function. This finding strongly supports the volume theory of this work. Dissert. Abstr.

N75-22559*# Texas Instruments, Inc., Dallas. Equipment Group.
S-BAND ANTENNA PHASED ARRAY COMMUNICATIONS SYSTEM Final Report
Dennis R. Delzer, J. E. Chapman, and R. A. Griffin Mar. 1975 282 p
(Contract NAS9-14196)
(NASA-CR-141756) Avail: NTIS HC $8.75 CSCL 17B

The development of an S-band antenna phased array for spacecraft to spacecraft communication is discussed. The system requirements, antenna array subsystem design, and hardware implementation are examined. It is stated that the phased array approach offers the greatest simplicity and lowest cost. The objectives of the development contract are defined as: (1) design of a medium gain active phased array S-band communications antenna, (2) development and test of a model of a seven element planar array of radiating elements mounted in the appropriate cavity matrix, and (3) development and test of a breadboard transmit/receive microelectronics module. Author

N75-22560*# Magnavox Co., Silver Spring, Md. Advanced Systems Analysis Office.
SHUTTLE COMMUNICATIONS DESIGN STUDY Final Report
David E. Cartier 31 Mar. 1975 305 p refs
(Contract NAS9-13791)
(NASA-CR-141761; ASAO-PR20056-12) Avail: NTIS HC $9.25 CSCL 17B

The design and development of a space shuttle communication system are discussed. The subjects considered include the following: (1) Ku-band satellite relay to shuttle, (2) phased arrays, (3) PN acquisition, (4) quadriplexing of direct link ranging and telemetry, (5) communications blackout on launch and reentry, (6) acquisition after blackout on reentry, (7) wideband communications interface with the Ku-Band rendezvous radar, (8) aeroflight capabilities of the space shuttle, (9) a triple multiplexing scheme equivalent to interplex, and (10) a study of staggered quadriphase for use on the space shuttle. Author

N75-22561*# Axiomatix, Marina del Rey, Calif.
INTEGRATED SOURCE AND CHANNEL ENCODED DIGITAL COMMUNICATION SYSTEM DESIGN STUDY Final Report
Gaylord K. Huth, Bruce D. Trumpis, and Sergei Udalov 25 Apr. 1975 45 p refs
(Contract NAS9-13467)
(NASA-CR-141779; R7504-1) Avail: NTIS HC $3.75 CSCL 17B

Various aspects of space shuttle communication systems were studied. The following major areas were investigated: burst error correction for shuttle command channels; performance optimization and design considerations for Costas receivers with and without bandpass limiting; experimental techniques for measuring low level spectral components of microwave signals; and potential modulation and coding techniques for the Ku-band return link. Results are presented. Author

N75-22562*# Scientific Translation Service, Santa Barbara, Calif.
OPERATION CONTROL SYSTEM FOR AIRCRAFT
K. Busch and H. Bruemmer Washington NASA May 1975 22 p Transl. into ENGLISH from German patent Auslegeschrift no. 1623888, German class 42d 1/12; International class Gold, 5/39; Reference P1623888.3-52 (34694), 25 Oct. 1967 9 p
(Contract NASw-2483)
(NASA-TT-F-16362) Avail: NTIS HC $3.25 CSCL 17B

A description is given of a German patent used for operational

monitoring for aircraft, using the multiplex method of a large number of measurement transducers, producing the measured variables in the form of electrical output signals. Author

N75-22563*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SPEECH ANALYZER Patent Application
Donald C. Lokerson, inventor (to NASA) Filed 9 Apr. 1975 23 p
(NASA-Case-GSC-11898-1; US-Patent-Appl-SN-566494) Avail: NTIS HC $3.25 CSCL 17B

A speech signal is analyzed by applying the signal to formant filters which derive first, second, and third signals respectively representing the frequency of the speech waveform in the first, second, and third formants. A first pulse train having approximately a pulse rate representing the average frequency of the first formant is derived; second and third pulse trains having pulse rates respectively representing zero crossings of the second and third formants are derived. The first formant pulse train is derived by establishing N signal level bands, where N is an integer at least equal to two. Adjacent ones of the signal bands have common boundaries, each of which is a predetermined percentage of the peak level of a complete cycle of the speech waveform. Normalization was attained in each instance by counting the number of pulses in the first and third pulse trains over the interval required for the pulses in the second train to reach a predetermined number. The resulting normalized pulse trains are supplied to a memory to identify a phoneme in the speech signal or are transmitted as narrow band width signals. NASA

N75-22564# California Univ., Livermore. Lawrence Livermore Lab.
RECENT FOUR-D CALCULATIONS OF TIME DEPENDENT PROPAGATION PHENOMENA
J. A. Fleck, Jr. and J. R. Morris Sep. 1974 41 p refs Presented at the 1st Dept. of Defense Conf. on High Energy Laser Technol., San Diego, 1 Oct. 1974 Sponsored by ERDA
(UCRL-75852; Conf-741062-1) Avail: NTIS HC $3.75

Thermal blooming under conditions where wind patterns lead to steady state density distributions is well understood. A fully time dependent calculation is required in three regimes. These are (1) CW propagation in the presence of stagnation or dead zones; (2) multipulse propagation; and (3) transsonic slewing. A steady state solution to the linearized hydrodynamic equations cannot exist. For any practical propagation application, however, the exact transsonic condition is not very important, since it applies over an exceedingly small portion of the total propagation path. For wind speeds differing from M = 1 by the order of .01, the time required for a steady density distribution to set in is equivalent to that corresponding to a wind speed of a few meters per sec. Therefore, propagation involving near sonic slewing should be accurately analyzable in terms of steady state solutions to the linearized hydrodynamic equations. Author (NSA)

N75-22565# Loughborough Univ. of Technology (England). Dept. of Mathematics.
ON THE SUPERPOSITION OF ELECTROMAGNETIC WAVES IN GENERAL RELATIVITY
J. B. Griffiths Aug. 1974 13 p refs
(MATHS-Res-46) Avail: NTIS HC $3.25

To investigate the nature of nonlinear gravitational interaction between electromagnetic waves in general relativity, the exact solution of the Einstein-Maxwell field equations describing two interacting null electromagnetic waves was studied. It is shown that, in a region of space-time containing two independent electromagnetic waves propagating in different directions, it is not possible for the two waves to follow simultaneously affinely parameterized shear-free and twist-free null geodesic congruences. ESRO

N75-22566# Stanford Research Inst., Menlo Park, Calif.
RADIATION OF ELECTROMAGNETIC WALSH WAVES Final Report
S. C. Fralick and D. L. Nielson Dec. 1974 84 p refs
(Contract F44620-72-C-0020; SRI Proj. 1556)
(AD-A007066; AFOSR-75-0395TR) Avail: NTIS CSCL 17/2

The research demonstrates the feasibility of radiating Walsh waves by developing a Walsh function generator, connecting it to several specially designed antennas, and recording the radiated field. GRA

N75-22567# Illinois Univ., Savoy. Aviation Research Lab.
TARGET DETECTION ASSESSMENT USING AN ORTHOGONAL MIXED FACTOR CENTRAL COMPOSITE DESIGN
Lawrence A. Scanlan and Christine Clark Oct. 1974 11 p refs
(Contract F44620-70-C-0105; AF Proj. 9778; AF Proj. 6813)
(AD-A006999; ARL-74-15/AFOSR-74-10; AFOSR-75-0387TR) Avail: NTIS CSCL 17/9

Target detection performance on a time-compressed radar display with both spatial and temporal cues was investigated. The effects of six variables (frame duration, noise level, clutter level, number of stored frames, target speed, and target direction) were examined using an orthogonal mixed-factor central-composite response surface experimental design. Results are discussed in terms of the contributions of spatial and temporal cues to detection performance. A methodological discussion of the experimental design is also included. GRA

N75-22568# Naval Ordnance Lab., White Oak, Md.
SYNTHESIS OF STEADY-STATE SIGNAL COMPONENTS BY AN ALL DIGITAL SYSTEM Final Report
Robert H. Davis 5 Dec. 1974 106 p refs
(AD-A006836; NOLTR-74-215) Avail: NTIS CSCL 17/2

Various algorithms for generating steady state signals by an all-digital synthesizing system are presented and analyzed. The emphasis is on evaluating the results obtained with synthesis algorithms which employ approximations or short-cuts to decrease implementation costs. Algorithms for generating both broadband and discrete or narrowband signal components using Fast Fourier Transform (FFT) techniques are investigated, and the output spectra for the approximate techniques are derived and compared to the spectra obtained with direct approaches. Finally an algorithm for the generation of arbitrary periodic signals in the time domain is presented and the spectrum of its output derived. GRA

N75-22569# Harris Corp., Melbourne, Fla. Electronic Systems Div.
MULTIPLE TARGET INSTRUMENTATION RADAR, PHASE 2 Bimonthly Report, Jan. - Feb. 1975
Duane E. Bowyer 10 Mar. 1975 11 p ref
(Contract N00014-75-C-0033)
(AD-A006925; JA-1543-3) Avail: NTIS CSCL 17/9

The objective of the present study is to develop the logic for the Radar Operating Procedure (ROP), and implement a system simulation to verify the effectiveness of the design. GRA

N75-22570# Naval Research Lab., Washington, D.C.
QUALITY AND ACCEPTABILITY TESTING OF VOICE PROCESSORS FOR MILITARY APPLICATIONS
David C. Coulter 15 Nov. 1975 23 p refs
(AD-A002925/6; NRL-7773) Avail: NTIS HC $3.25 CSCL 17/2

The application of digital voice communication systems for military usage was hampered by the lack of reliable predictions of system voice quality and acceptability. Although intelligibility tests have proved useful to system designers and have provided lower limits to system acceptability, there was no simple method for rank ordering voice processors operating in a given transmission environment with respect to voice quality. A method for rank ordering which is useful for up to about ten systems and gives reliable results is described. This evaluation shows the ability of the test to rank order systems under simulated transmission conditions. It should be noted that adding a new system to a previous ranking with this method is difficult and may require rerunning the entire test. GRA

N75-22571# Lincoln Lab., Mass. Inst. of Tech., Lexington.
PRELIMINARY INVESTIGATION OF DIGITAL SPEECH PROCESSOR HARDWARE IMPLEMENTATIONS
Peter E. Blankenship 5 Feb. 1975 40 p refs
(Contract F19628-73-C-0002)
(AD-A007062; TN-1975-8; ESD-TR-75-116) Avail: NTIS CSCL 17/2

The current Lincoln Digital Voice Terminal design, analyzed

with the intent of improving cost and form factor, is found to be memory dominant. Custom LSI and hybrid packaging are evaluated as to potential impact on the current design. Semi-programmable architectures based on commercially available bipolar microprocessors are viewed as near term solutions to the inexpensive mass-producible narrow band voice terminal design problem. GRA

N75-22572# Eagle-Picher Industries, Inc., Joplin, Mo. Couples Dept.
MANUFACTURING METHODS AND TECHNOLOGY MEASURE FOR PLASTIC HOUSINGS FOR C-2328-B-GRA-39 AND C-2329-B-GRA-39 RADIO Quarterly Progress Report, 1 May-31 Jul. 1974
Dale V. Gordon 23 Jan. 1975 13 p
(Contract DAAB05-73-2081)
(AD-A007256; QPR-4) Avail: NTIS CSCL 17/2

The objective of the project is to perform the production engineering required to permit the replacement of aluminum housings with molded plastic housings for the AN/GRA-39B Radio Telephone. GRA

N75-22573# Naval Electronics Lab. Center, San Diego, Calif.
SUDDEN IONOSPHERIC DISTURBANCE GRID Research and Development Report, 15 Sep. 1973 - 15 Jun. 1974
R. B. Rose, J. R. Hill, and M. P. Bleiweiss 1 Dec. 1974 41 p refs
(WF52551; NELC Proj. M207)
(AD-A006567; NELC-TR-1938) Avail: NTIS CSCL 17/2

The technique described will allow controllers to quickly determine (1) whether a short wave fade in progress will affect any of their hf circuits, (2) the degree to which each circuit is affected, (3) alternative frequencies, and (4) alternative traffic routes available. The only required input parameter is 1 - 8A X-ray flux. The computer program continuously displays the LOF over any number of preselected hf transmission paths in predictive, real-time, or historical mode. The technique was designed primarily for naval commands which control hf systems covering large geographical areas, such as Communication Area Management Sections at Navy Communications Stations and HF Direction Finding Net Control. GRA

N75-22574# Ohio State Univ., Columbus. ElectroScience Lab.
THE DEVELOPMENT OF A MULTITURN LOOP ANTENNA FOR THE AN/PRC-77
R. J. Davis Dec. 1974 92 p refs
(Contract N00123-74-C-0645)
(AD-A006929; ESL-3824-1) Avail: NTIS CSCL 17/2

An electrically small antenna element, the multiturn loop, is proposed as a replacement for the three-foot monopole standard on the AN/PRC-77 and AN/PRC-25. The principal objective was to develop a multiturn loop with an omnidirectional pattern and approximately the gain of the standard monopole. Based on past experience with multiturn loop antennas, loop configurations were selected which would minimize the increase in packset size for top, bottom and back-side mounting locations. Patterns were measured for these configurations and compared with patterns of the standard monopole antenna. Parameters were varied (loop size, turn spacing and position on the packset) to optimize the radiation efficiency of the multiturn loop. GRA

N75-22575# Texas Univ., Austin. Applied Research Labs.
EXPERIMENTS IN RADAR RANGE RESOLUTION ENHANCEMENT BY DIGITAL INVERSE FILTERING Final Report
Darrell K. Ingram and Frederick L. Beckner Jan. 1975 83 p refs
(Contract DAAD07-73-C-0196; DA Proj. 1U7-65711-DE-93)
(AD-A006573; ARL-TR-75-1) Avail: NTIS CSCL 17/9

The feasibility of enhancing radar range resolution by digital inverse filtering is discussed. Limitations of using either a Biomation Model 8100 transient recorder or a Tektronix Model R7912 transient recorder in digitizing radar IF waveforms are discussed. A new form of digital inverse filter, the bandwidth expansion filter, is discussed and the results of computer simulation and hardware experiments using this filtering technique are presented. Three different techniques for real time implementation of inverse filtering are discussed. GRA

N75-22576# Georgia Inst. of Tech., Atlanta. School of Electrical Engineering.
TIME AND FREQUENCY RESOLUTION IN SPEECH ANALYSIS AND SYNTHESIS Final Report
Aubrey M. Bush 10 Jan. 1975 33 p refs
(Grant DA-ARO(D)-31-124-71-G126)
(AD-A007247; E21-611-74-BU-2; ARO-10096-5-EL) Avail: NTIS CSCL 17/2

A problem basic to the development of all digital telecommunication systems is the efficient digital encoding of speech signals for transmission. Many speech digitization algorithms have been proposed. This study, using as a research vehicle the homomorphic vocoder algorithm, is directed toward determining the time resolution and the frequency resolution required to faithfully reproduce a speech signal. The results reported are fundamental in that they are applicable to any speech digitization algorithm. The resolutions required for typical speaker situations are summarized. GRA

N75-23089 Army Aeromedical Research Lab., Fort Rucker, Ala.
CHARACTERISTICS OF NEW GENERATION MILITARY NOISE CANCELING MICROPHONES
Robert T. Camp, Jr., Ben T. Mozo, and James H. Patterson *In* AGARD Med. Requirements and Exam. Procedures in Relation to the Tasks of Today's Aircrew Feb. 1975 6 p (For availability see N75-23084 14-51)

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics*.

N75-22577 Stanford Univ., Calif.
LOW-NOISE AMPLIFICATION OF LOW-FREQUENCY SIGNALS FROM HIGH IMPEDANCE CAPACITIVE SOURCES Ph.D. Thesis
James Alvin Davis 1974 266 p
Avail: Univ. Microfilms Order No. 75-6832

Low-frequency parametric amplifiers using time-varying metal plate capacitors are shown to offer the ultimate in low-noise, low-frequency amplification. Amplifiers with PN junction inputs are shown to be unsuitable because of the shot noise associated with their leakage currents. Amplifiers using insulated-gate field-effect transistors (IGFETs) as input devices and low-frequency parametric amplifiers using insulated-gate varactors (IGVs) are compared. An analysis of the low-frequency noise produced by traps under the large-signal, nonequilibrium varactor operating conditions shows that the varactor operating conditions produce only small perturbations in the behavior of the long time-constant traps responsible for the low-frequency noise. Traps located near the Si-SiO2 interface are shown to produce comparable amounts of noise in the IGFET and the IGV.
Dissert. Abstr.

N75-22578 Wisconsin Univ., Madison.
SUPERCONDUCTIVE ENERGY STORAGE INDUCTORS: INTERNAL TRANSIENT OSCILLATIONS AND EDDY CURRENT LOSSES Ph.D. Thesis
David Peter Hartmann 1974 117 p
Avail: Univ. Microfilms Order No. 74-28804

The effects of fault induced transient oscillations are investigated using both analytic equations and a digital computer solution to state-space analysis of pi-section equivalent circuits. It was found that, because of the damping of the external resistance in the inverter-converter portion of the superconductive energy storage inductor system, the possibility of transient induced long term oscillations is precluded. An eigenvalue solution for the relaxation modes of a filamentary model for square and

rectangular cross section, very long, isolated conductors was achieved using the EISPACK computer routine. Through the use of Fourier-series analysis, it was possible to obtain MODAL solution for the effective resistance ratios and for relative current density distributions. Dissert. Abstr.

N75-22579 California Univ., Los Angeles.
SYMMETRIC COUPLED-RESONATOR FILTERS Ph.D. Thesis
Harlow Clark Bell, Jr. 1974 121 p
Avail: Write to author at 16329 Napa Street, Sepulveda, Calif. 91343. After 15 Nov. 1977 copies can be obtained from Univ. Microfilms Order No. 75-5703

The design and analysis of lumped-element lowpass equivalent circuits for structurally symmetric, narrow-passband coupled-resonator filters are discussed. The transformation from the lowpass to the bandpass circuit is based on the narrow-band approximation of circuit theory. With this approximation a single lowpass circuit can serve as a prototype for bandpass filters within the flexible narrow-band constraint. A canonical lowpass prototype network for symmetric coupled-resonator filters is presented. A new transformed variable for the narrow-band approximation is introduced. Equiripple and maximally-flat passband, general stopband, amplitude response approximations in the transformed variable are discussed. The element values of the canonical prototype are determined. Circuit analysis shows that only a single set of simultaneous linear equations need to be solved to yield all first-order element-value sensitivities of the transducer function. Pole-zero analysis is also discussed.
Dissert. Abstr.

N75-22580 Stanford Univ., Calif.
PARAMETRIC INTERACTIONS OF ACOUSTIC RAYLEIGH WAVES Ph.D. Thesis
William Robert Shreve 1974 218 p
Avail: Univ. Microfilms Order No. 75-6924

The development of Rayleigh wave parametric convolvers for signal processing applications is presented. These devices utilize the interaction of oppositely propagating surface waves to generate a signal which has the form of the convolution of the input waveforms. The convolution interaction forms the basis for a wide variety of signal processing functions including matched filtering, pulse compression, and Fourier transformation. The parametric convolvers described here are capable of performing any of these functions when the proper reference input is used. They are therefore very flexible signal processors. Piezoelectric convolvers in both degenerate and nondegenerate configurations were constructed on Y-cut, Z-propagating lithium niobate substrates and fully characterized. These devices were operated as matched filters for both amplitude and phase modulated coded inputs. Dissert. Abstr.

N75-22581 Polish Academy of Sciences, Warsaw.
UNSTEADY STATE OF SUPPLEMENTARY SYSTEMS AND THE NEGATIVE CAPACITANCE OF PIEZOELECTRIC TRANSDUCERS UNDER ROUGH VIBRATION CONDITIONS [STANY NIEUSTALONE, UKLAD ZASTEPCZY I UJEMNA POJEMNOSC PIEZOELEKTRYCZNEGO PRZETWORNIKA O DRGANIACH GRUBOSCIOWYCH]
Leszek Filipczynski 1974 29 p refs In POLISH
Avail: Issuing Activity

Methods are presented for calculating the forms and sizes of ultrasonic impulses generated through a piezoelectric transducer (with a large coupling coefficient) radiating ultrasonic waves for biological systems. The influence of a negative capacitance of the transducer on its vibration was also investigated. Other topics discussed include supplementary electrical circuits, thyristors, electrical impedance, resonant frequencies, electromechanical transducers, and electromechanical coupling coefficient.
Transl. by M.J.S.

N75-22582*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
INSTALLATION PROCEDURE FOR SURFACE-MOUNTED FLAT CONDUCTOR CABLE USED IN COMMERCIAL AND RESIDENTIAL WIRING
James R. Carden Mar. 1975 31 p
(NASA-TM-X-64916) Avail: NTIS HC $3.75 CSCL 09C

The installation procedures for surface-mounted flat conductor cable used in commercial and residential wiring are described.
Author

N75-22583*# Teledyne Brown Engineering, Huntsville, Ala. Electronics and Engineering.
STANDARDIZED MULTIPLE OUTPUT POWER SUPPLY Final Report
E. V. Ragusa Apr. 1975 152 p
(Contract NAS8-29770)
(NASA-CR-120743; EE-MSFC-1888) Avail: NTIS HC $6.25 CSCL 09C

A comprehensive program to develop a prototype model of a standardized multiple output power supply for use in space flight applications is described. The prototype unit was tested and evaluated to assure that the design would provide near optimum performance for the planned application. The prototype design used a dc-to-dc converter incorporating regenerative current feedback with a time-ratio controlled duty cycle to achieve high efficiency over a wide variation of input voltage and output loads. The packaging concept uses a mainframe capable of accommodating up to four inverter/regulator modules with one common input filter and housekeeping module. Each inverter/regulator module provides a maximum of 100 watts or 10 amperes. Each module is adaptable to operate at any voltage between 4.0 volts and 108 volts. The prototype unit contains +5, + or - 15 and +28 volt modules. Author

N75-22584*# Kanner (Leo) Associates, Redwood City, Calif.
A DIRECT VOLTAGE CONVERTER WITHOUT TRANSFORMER
T. Kuzmiszkina and A. Matusewicz Washington NASA [1975] 16 p Transl. into ENGLISH from Przeglad Telekomunikacyjny (Poland), V. 46, no. 1, 1973 p 23-28
(Contract NASw-2481)
(NASA-TT-F-16174) Avail: NTIS HC $3.25 CSCL 09C

The operating principle is described for a direct voltage converter without a transformer, and an analysis, together with an example of a circuit is presented. The converter can be applied to supply electronic devices operating at low and high power consumption. The converter has a high power efficiency. Because the converter operates without a transformer, it can be designed using IC technology. Author

N75-22585# Defence Research Establishment Valcartier (Quebec).
A DIGITAL SCAN CONVERTER USING SEMICONDUCTOR MEMORY
G. Vail Feb. 1974 74 p refs
(DREV-R-702/74) Avail: NTIS HC $4.25

A scan conversion system is described which takes advantage of low cost integrated circuit semiconductor memories. The system provides 30 frame/second cathode ray tube imagery of data derived from a slow scan far-infrared camera and has a capability for computer interface via digital tape. Author

N75-22586# Australian Post Office Research Labs., Melbourne.
A TECHNIQUE FOR EVALUATING THE RETIMING OPERATION OF PRIMARY PCM REGENERATORS
G. J. Semple May 1974 49 p refs
(Rept-6852) Avail: NTIS HC $3.75

An experimental technique developed for assessing the retiming operation of commercial primary regenerators is presented. The test principle is illustrated with a theoretical analysis, which characterizes the operating properties of the class of pulse code modulation (PCM) regenerators which use single tuned circuits as timing extraction filters. Experimental results on commercial and experimental regenerators, together with computed results based on the theoretical analysis, illustrate the significance of various factors involved in the clock extraction circuit of a PCM regenerator. The effect of various impairments which arise in a practical circuit are discussed. Author

N75-22587# Sandia Labs., Albuquerque, N.Mex.
A 2 MV, MULTICHANNEL, OIL-DIELECTRIC, TRIGGERED SPARK GAP
K. R. Prestwich 1974 22 p refs Presented at Intern. Conf. on Energy Storage, Compression, and Switching, Turin, Italy,

5 Nov. 1974 Sponsored by ERDA
(SAND-74-5270; Conf-741113-3) Avail: NTIS HC $3.25

A 2 MV, low jitter, multichannel, oil-dielectric spark gap was developed to be used for switching the transmission lines of proposed new relativistics electron beam (REB) accelerators with substantially increased peak power. The switch is designed for operation in a strip-line geometry with three 122 cm long electrodes, two smooth bars, and one sharp-edged trigger blade. When a voltage pulse that rises to 1.5 MV in 20 nsec is applied to the trigger electrode, about 10 arcs will close simultaneously in 30 nsec with a standard deviation less than 2 nsec. The spark gap was installed on one of two 22 omega 20 nsec strip transmission lines connected as a Blumlein test. The Blumlein output voltage pulse risetime decreases with increasing number of switch channels (13 nsec with 2 channels to 5 nsec for 14 channels). The effects of the interelectrode capacitance and isolation resistance on the operation of the switch are discussed. Design data for a prototype REB accelerator using twelve of these switches in parallel are presented. Author (NSA)

N75-22588# Sandia Labs., Albuquerque, N.Mex.
LIGHTNING PROTECTION PROVIDED BY THE LIGHTNING ARRESTOR CONNECTOR IN CONJUNCTION WITH DOWNSTREAM INDUCTANCE
C. E. Jackson Jan. 1975 22 p refs
(Contract AT(29-1)-789)
(SLA-74-0118) Avail: NTIS HC $3.25

A description is given of the results of an analysis performed to evaluate the feasibility of replacing the downstream switches currently used in conjunction with the lightning arrestor connector (LAC) in weapon system applications with downstream inductance coils. Author (NSA)

N75-22589# Sandia Labs., Livermore, Calif.
ACTIVE RC FILTER DESIGN USING COMPENSATED OPERATIONAL AMPLIFIERS
M. A. Soderstrand and J. Szczupak Sep. 1974 12 p refs Presented at 17th Mid-West Symp. on Circuits and Systems, San Francisco, 21 Arp. 1974
(Contract AT(29-1)-789)
(SAND-74-8632; Conf-740484-1) Avail: NTIS HC $3.25

An active RC filter design procedure which accounts for the nonideal effects caused by the frequency compensation required for an operational amplifier is presented. The important properties of the ideal filter structure are realized and the frequencies at which the structure is usable are increased through proper topology choice. The topology selection criteria are based on the circuit design using ideal operational amplifiers. The procedure permits the designer to obtain the most out of the gain-bandwidth of the actual operational amplifier chosen for use in the circuit. Author (NSA)

N75-22590# Oesterreichische Studiengesellschaft fuer Atomenergie G.m.b.H., Seibersdorf. Physik-Inst.
COMPUTER-OPERATED PRINTED CIRCUIT LAYOUT
J. Kaltseis Oct. 1974 28 p refs In GERMAN
(SGAE-2345; PH-17/74) Avail: ERDA Depository Libraries HC $4.50

A system for minicomputer-driven interactive printed circuit board layout generating is described. The system is especially useful for the user geared to low-volume production of many different types of boards of different size, electronics, and line density. The primary advantage of this system is that the layout is under the designer's continual supervision and control. The system is capable of displaying the current state of the layout after each modification; thus the designer becomes aware of errors as soon as they occur. The hardware consists of a PDP-11 minicomputer (any type), teleprinter, storage scope, 20-function keyboard, and an incremental plotter. Author (NSA)

N75-22591# Brookhaven National Lab., Upton, N.Y.
MAGNETIZATION AND DESIGN OF MULTISTRAND SUPERCONDUCTING CONDUCTORS
C. R. Walters 30 Sep. 1974 4 p refs Presented at Appl. Superconductivity Conf., Oakbrook, Ill., 30 Sep. 1974
(BNL-19272) Avail: NTIS HC $3.25

Magnetization of cabled and braided samples which are long compared to their transposition lengths was measured in a uniform magnetizing field directed at right angles to their widths. A separated double pancake with nonuniform windings was constructed to produce a suitably uniform radial field in which long coiled samples could be placed. Magnetization losses also were measured in the ISA I magnet. Results are compared with theories which are due to Wilson and, basically, Morgan. Also, design optimization procedures were defined for the use of multistrand conductors in magnet windings. Author (NSA)

N75-22592# California Univ., Livermore. Lawrence Livermore Lab.
INDUCED GROUND CURRENT FLOW PATTERNS FOR ELEVATED WIRE ANTENNAS
E. K. Miller and F. K. Deadrick 7 Nov. 1974 12 p ref
(Contract W-7405-eng-48)
(UCRL-51700) Avail: NTIS HC $3.25

A preliminary approach to the efficient design of antenna ground screens is presented. Indications are that prior knowledge of the distribution pattern of the perfect-ground induced currents may permit more efficient specification of the ground screen geometry. A method of computing perfect ground plane surface currents, which are plotted to show both the direction and magnitude of induced ground current patterns is given and illustrated with several numerical examples. Author (NSA)

N75-22593# Centre National de la Recherche Scientifique, Toulouse (France). Lab. d'Automatique et d'Analyse des Systemes.
PROPERTIES OF A DIFFUSED J FET WITH VERTICAL CHANNEL ARRANGEMENT
J. L. MorenzaGil and D. Esteve 1974 12 p refs Presented at the 4th European Solid State Device Res. Conf., Nottingham, Engl., 16-19 Sep. 1974
(LAAS-Publ-1191) Avail: NTIS HC $3.25

The electrical properties and operation analysis of an entirely diffused test J FET with vertical channel arrangement for high power applications is presented. The gate was buried for wider available area on which to put the source contact. The device can operate at hundreds of watts dc but still displays isolation deficiencies hindering the production of large devices. Devices with pinched off and opened channels were produced. ESRO

N75-22594# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
DESIGN OF A COLLIMATING LENS FOR A LIMITED SCAN ARRAY
Lore Zahn 2 Oct. 1974 30 p refs
(AF Proj. 6746)
(AD-A006680; AFCRL-IP-223; AFCRL-TR-74-0492) Avail: NTIS CSCL 09/1

This report describes the design and testing of two types of dielectric lenses used to collimate the beam of a limited-scan array. Though intended mainly to improve the broadside radiation characteristics of the array, the experimental results show substantial improvement in the scanned array behavior attributable to the use of lenses. GRA

N75-22595# Harry Diamond Labs., Washington, D.C.
DESIGN OF DIELECTRIC-LOADED CIRCUMFERENTIAL SLOT ANTENNAS OF ARBITRARY SIZE FOR CONICAL AND CYLINDRICAL BODIES
Howard S. Jones, Jr. Sep. 1974 33 p refs
(DA Proj. 1W3-62301-A-30; HDL Proj. A20415)
(AD-A007140; HDL-TR-1684) Avail: NTIS CSCL 09/5

A class of dielectric-loaded slot antennas designed to conform to the shape of various body structures is described. These antennas are flush with the body surface, and designed to occupy minimum space. The basic radiating structure is a low-loss dielectric-core substrate plated with a thin copper wall to form a dielectric-filled cavity. A circumferential radiating slot is in the outer surface of the cavity. The cavity is excited by an inductive post driven from a coaxial line. The conformal radiating slot can be designed in the surface of small or large dielectric structures and results in durable antennas that may operate in the UHF or microwave frequency regions. It is efficient, operates very well over a 10% bandwidth, and can be designed to produce many desired antenna patterns. Theory and experimental data on the different modes of radiation are discussed, along with the intrinsic

characteristics of the selected dielectric materials. Design techniques, performance characteristics, and illustrations of a variety of prototype antennas are presented. GRA

N75-22596# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.

MICROWAVE DIELECTRIC RESONATOR-TUNING Physical Sciences Research Paper

Uve H. W. Lammers and Martin R. Stiglitz 3 Oct. 1974 24 p (AF Proj. 5635)

(AD-A006689; AFCRL-PSRP-605; AFCRL-TR-74-0497) Avail: NTIS CSCL 09/1

Dielectric resonators have applications as low-loss compact filters in the microwave region. Tuning characteristics of dielectric resonators that might allow for temperature compensation and frequency variability were investigated both theoretically and experimentally at L band. A secondary dielectric resonator that is offset in frequency from the tuned resonator provides a maximum tuning range of approximately 10 percent before an additional filter loss of 3 dB is incurred; the rate of tuning is slow since it is done by changing the resonator coupling (spacing). For fast tuning, a varactor is used in a coupled resonant circuit. Frequency changes can then be made in a time interval approaching 1/(filter bandwidth), but in this case the maximum tuning range before an additional filter loss of 3 dB is incurred is reduced to 2 percent of the filter frequency. GRA

N75-22597# Army Mobility Equipment Research and Development Center, Fort Belvoir, Va.

NONLINEAR HOMOPOLAR INDUCTOR ALTERNATORS ON NONLINEAR LOADS, PART 1 Technical Report, Dec. 1970 - Dec. 1973

A. L. Jokl and L. I. Amstutz Oct. 1974 145 p refs

(DA Proj. 1T1-61102-A-34A)

(AD-A007123; USAMERDC-2113-Pt-1) Avail: NTIS CSCL 10/2

A two-dimensional numerical analysis of the cross section of a homopolar inductor alternator supplying a rectifier load is developed. Besides the effects of the nonlinearities of the magnetic materials, the eddy currents induced in the rotor by the nonlinear load are considered. Thus, some of the partial difference equations are parabolic. The analysis is applied to determine eddy currents, waveshapes, and field excitations. The calculations are made for a 95 kVA homopolar inductor alternator, 115/200 V;3-phase; 3,400 Hz; 40,800 r/min. GRA

N75-22598# Cornell Univ., Ithaca, N.Y.

FLOATING-POINT COEFFICIENT SENSITIVITY AND ROUNDOFF NOISE OF RECURSIVE DIGITAL FILTERS REALIZED IN LADDER STRUCTURES

Walter H. Ku and Siu-Ming Ng Feb. 1975 55 p Prepared in cooperation with Calif. Univ., Berkeley

(Contract F30602-72-C-0497; AF Proj. 9567)

(AD-A007031; RADC-TR-75-26) Avail: NTIS CSCL 09/5

Coefficient sensitivity and roundoff error with floating-point rounding have been investigated for several digital ladder filter structures. It is found that in all the cases studied, the ladder structures first proposed by Fettweis show a much lower coefficient sensitivity. In this paper, a hybrid cascade structure is proposed and synthesized. Its coefficient sensitivity is found to be between a conventional cascade structure and the ladder structures. Roundoff error is also investigated by extensive simulation. The new Fettweis ladder structure is found to exhibit the lowest roundoff error. This result is in agreement with the theoretical study which indicates that digital filters which exhibit reduced attenuation sensitivity tend to have less roundoff error. GRA

N75-22599# IIT Research Inst., Chicago, Ill.

NUCLEAR ELECTROMAGNETIC PULSE (NEMP) HARDENED CABLES Semiannual Report, 1 Jul. 1973 - 30 Jun. 1974

William C. Wells Jan. 1975 71 p refs

(Contract DAAB07-73-C-0341)

(AD-A006642; ECOM-0341-1-73) Avail: NTIS CSCL 09/1

When a system is exposed to a Nuclear Electromagnetic Pulse (NEMP), the cables which are used to connect the components act as antennas and couple NEMP energy into the system. The purpose of the program is to develop shields for a 26-pair communications cable which will significantly reduce the NEMP pickup. Because of the technical approach employed, however, many results of more general interest are obtained. GRA

N75-22600# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

THE ANALYSIS OF THE DISCRETE UNITS OF A FLIGHT TRACKING GONIOMETER WITH ANTENNA PHASE ARRAY

E. E. Nemirovskii 5 Feb. 1975 16 p refs Transl. into ENGLISH from Elektron. Tekhn., (SIC) (USSR), no. 1, Jan. 1970 p 6-13 (FTD Proj. T74-05-12)

(AD-A007226; FTD-HT-23-0849-75) Avail: NTIS CSCL 17/7

The block-diagram of a flight tracking goniometer with antenna phase array is given and the fundamental relationships for selecting the word format and the speed of the phase computer were obtained. Equipment expenditures during the use of two types of logics of the semiconductor integrated circuits were determined: resistor-transistor and transistor-transistor. GRA

N75-22601# Princeton Univ., N.J. Dept. of Civil and Geological Engineering.

NONLINEAR EFFECTS OF INITIAL BENDING ON THE VIBRATIONS OF CRYSTAL PLATES Final Report, 1 Jul. 1973 - 30 Jun. 1974

P. C. Y. Lee, Y. S. Wang, and X. Markenscoff Mar. 1974 31 p refs

(Contract DAAB07-73-C-0226; DA Proj. 1S7-62705-A-058)

(AD-A006648; ECOM-73-0226-F) Avail: NTIS CSCL 09/1

The changes in the resonance frequencies of circular crystal plates subject to initial bending stresses are studied. The plate is flexed as a cantilever clamped near the edge and stressed by a transverse, concentrated force applied at a point diametrically opposite the support. A system of plate equations which takes into account the nonlinear effects due to the large, initial deflection and to the third-order elastic stiffness coefficients in the stress-strain relations is employed. In obtaining the initial fields caused by bending, strain components are assumed to be small, but large gradient of plate deflection and large rotations of the plate element about x sub 1 and x sub 3 axes are permissible by retaining their quadratic terms in the strain-displacement relations. The changes of resonance frequencies of fundamental thickness-shear vibrations are calculated for rotation Y-cuts of quartz piezoelectric crystals. The calculated frequency changes are compared with experimental values as a function of the magnitude of the position, the azimuth angle psi, and also as a function of the magnitude of the force P. GRA

N75-22602# Naval Missile Center, Point Mugu, Calif.

ASYMMETRICALLY FED ELECTRIC MICROSTRIP DIPOLE ANTENNA

C. M. Kaloi 31 Jan. 1975 22 p refs

(AD-A006782; NMC-TP-75-03) Avail: NTIS CSCL 09/1

A theoretical and experimental study has been made on several different types of microstrip antennas. A general theory for this family of microstrip antennas has been formulated and a report is planned to be published soon. This report applies the results of the above study to a specific type of microstrip antenna, namely, the asymmetrically fed electric microstrip dipole. Design equations that are sufficiently accurate to specify the important design properties of the asymmetrically fed electric microstrip dipole antenna are also included. These design properties are the input impedance, the gain, the bandwidth, the efficiency, the polarization, the radiation pattern, and the antenna element dimension as a function of frequency. Except for the H-plane radiation pattern plot, the calculated results are in good agreement with the test results. The discrepancy in the H-plane plot is due mostly to ground plane effects and these effects were not included in the equations. GRA

N75-23467 Joint Publications Research Service, Arlington, Va.

ACTIVITIES OF ELECTRONICS INSTITUTE DESCRIBED

Emil Dzhakov *In its* Transl. on Eastern Europe: Sci. Affairs, No. 463 (JPRS-64694) 5 May 1975 p 10-16 Transl. into ENGLISH from Priroda (Sofia), no. 1, 1975 p 12-15 (For availability see N75-23465 14-99)

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics*.

N75-22603 Columbia Univ., New York.
AN ASYMPTOTIC METHOD FOR THE COMPUTATION OF LAMINAR SHEAR STRESS AND HEAT FLUX IN FORCED AND FREE CONVECTION Ph.D. Thesis
Isai-Tse Kao 1974 203 p
Avail: Write author at 342 King's Rd., 3d Fl., North Point, Hong Kong. After 1 June 1976 copies can be obtained from Univ. Microfilms Order No. 75-5226

A technique was developed and applied to the solution of laminar incompressible nonsimilar boundary-layer problem with forced and free convection. The basic feature of this technique involves the finding of a strained value of the parameter which characterizes the nonsimilarity introduced into the problem. The corresponding zero order solution (or similarity solution) provides almost exact shear stress and heat transfer results. The method can be applied locally (independent of information from other stream-wise locations). Working charts and tables are provided for the following cases: (1) laminar incompressible forced convection fluid flow with nonsimilarity introduced by arbitrary free-stream velocity distributions; (2) laminar incompressible forced convection with arbitrary suction or injection of fluid at the wall; and (3) free convection along a vertical plate with either prescribed variable wall temperature or wall heat flux.
Dissert. Abstr.

N75-22604 Case Western Reserve Univ., Cleveland, Ohio.
THE TIME-DEPENDENT FLOW IN LARGE LAKES WITH APPLICATION TO LAKE ERIE Ph.D. Thesis
Aminul Haq 1974 221 p
Avail: Univ. Microfilms Order No. 75-5062

The time dependent wind driven flow in large lakes is investigated. The mathematical model is based on a shallow lake theory developed by Welander. It is assumed that the lake is homogeneous, that nonlinear inertial forces are small by comparison with Coriolis forces and that the effects of horizontal friction are not important. Further, it is assumed that the pressure is hydrostatic and that the turbulence in the lake can be modelled by a constant vertical eddy diffusivity. By analytically examining the flows in simple geometries, the important time scales are identified and simple analytic formulas are obtained for these time scales. The conditions under which each of these time scales is important are investigated. In addition, the rigid-lid and free surface models are compared. The analytic results are verified by comparison with numerical calculations.
Dissert. Abstr.

N75-22605 Princeton Univ., N.J.
AN INVESTIGATION OF THE APPLICATION OF THE MICROFLUID THEORY TO TURBULENCE Ph.D. Thesis
Patrick Mary OLeary 1974 83 p
Avail: Univ. Microfilms Order No. 75-6706

The application of the microfluid theory to turbulence was discussed along with previous attempts at such application. A form of stress tensor analogous to the Reynolds stresses is introduced. The field equations to determine the velocity and microgyration fields and the boundary conditions are presented. In order to test the applicability of the theory to a particular physical problem, the solution of the two-dimensional channel flow is given and compared with the experimental data. The equations of motion that are obtained are nonlinear, and so numerical methods have to be used in order to solve them. Since the microfluid theory contains constants that were not previously calculated, assumptions based on experimental data were made about some of the flow properties. The results on velocity fields, transition from laminar to turbulent motions are encouraging.
Dissert. Abstr.

N75-22606 Illinois Univ., Champaign.
TURBULENT VELOCITY FIELD STRUCTURE IN A ROUND JET AND ITS RELATION TO FLUCTUATING PRESSURE FIELDS Ph.D. Thesis
David Paul Weber 1974 327 p
Avail: Univ. Microfilms Order No. 75-464

An experimental examination of the turbulent velocity field structure in a 2.5 inch cold jet was performed. Primary emphasis was given to the description of the structure within the driven shear layer to five diameters downstream. Both single point and two point correlation measurements were made with a special emphasis on the modeling of the two point covariance function with axisymmetric tensor forms. A higher order stochastic analysis of the velocity field was performed using an extended version of the single variate Gram-Charlier expansion of the probability density function. A qualitative examination of the stochastic structure of the velocity field was performed using the Wiener-Hermite expansion theory for turbulence in an extended version to include the effect of mean velocity gradients. Results were to be used in the prediction of fluctuating pressure fields, as in the problem of aerodynamic noise generation, or in the more general shear flow dynamic equations.
Dissert. Abstr.

N75-22607 Kansas Univ., Lawrence.
AN INVESTIGATION OF THE APPLICABILITY OF A FIRST ORDER, EXPLICIT, FINITE DIFFERENCE, INTEGRATION TECHNIQUE TO SEPARATED AND REATTACHING FLOW PROBLEMS Ph.D. Thesis
Andrew Cavitt Cruce 1974 107 p
Avail: Univ. Microfilms Order No. 75-6171

A representative problem was chosen for which good experimental data were available, namely air flow at Mach number 3.0 past a back step. A solution to this problem was generated using the numerical integration technique, and the results of the numerical solution were compared with the experimental data. The effect of several nonlinear coordinate transformations on the numerical technique used was examined. It was found that the transformations introduced errors into the numerical solution. The shock propagation velocity predicted by the numerical technique was incorrect and depended on the degree of non-linearity associated with the particular problem. Further testing of a second order finite difference integration technique with a nonlinear coordinate transformation indicated that these higher order methods were not sensitive to nonlinear coordinate transformation. A multigrid integration net was devised for use with the first order finite difference technique.
Dissert. Abstr.

N75-22608 Princeton Univ., N.J.
THE DEVELOPMENT OF THE FLOW AROUND A YAWED CONE IN A HYPERSONIC, RAREFIED STREAM Ph.D. Thesis
Thomas Michal Dyer 1974 192 p
Avail: Univ. Microfilms Order No. 75-6636

The flow around a three-dimensional, yawed, pointed cone immersed in a hypersonic flow is discussed. A consistent phenomenological model was established which describes the transitional character of the flow from the kinetic, free-molecular regime upstream to the continuum, fluid-like regimes far downstream. In describing the complex three-dimensional situation, like the cone at angle of attack, the behavior along each ray as well as the azimuthal coupling of properties between adjacent rays are considered. At each juncture, data are compared with the pertinent flat plate or wedge data in order to isolate the various effects of local ray inclination, azimuthal interaction and axisymmetric geometry, and to ascertain the overall approach to continuum conditions. The problem was approached from a kinetic point of view with distances scaled on the appropriate mean free path and property transport based on molecular collisional interaction.
Dissert. Abstr.

N75-22609 Princeton Univ., N.J.
EXPERIMENTAL AND THEORETICAL INVESTIGATIONS OF THE RECIRCULATING FLOW REGION BETWEEN TWO-DIMENSIONAL, PARALLEL, SEPARATED JETS Ph.D. Thesis
Thomas James Rosfjord 1974 239 p
Avail: Univ. Microfilms Order No. 75-6710

The recirculating flow region existing near an injector face between two jets was investigated. In particular, various degrees of inlet jet asymmetry were studied. The inlet jets were

two-dimensional, parallel and separated by approximately ten jet widths. Experimental studies of a gaseous H2/O2 combusting system and a corresponding hydraulic simulation were included. Numerical solutions to the governing elliptic, partial differential equation system were obtained. The envelope of recirculating flow for non-combusting systems extended one jet downstream from the injector face. The corresponding region for a combusting flow extended approximately half as far downstream. A symmetric flow pattern, for a symmetric inlet condition (i.e., equal jet strength), was observed. Asymmetric inlet conditions resulted in at least a partial entrainment of the weaker jet by the stronger jet, where the relative jet strength is determined by the ratio of inlet jet momentum flux, MOMR. Dissert. Abstr.

N75-22610 California Univ., Davis.
THREE-DIMENSIONAL, STEADY, INVISCID FLOW FIELD CALCULATIONS WITH APPLICATION TO THE MAGNUS PROBLEM Ph.D. Thesis
Billy Robert Sanders 1974 172 p
Avail: Univ. Microfilms Order No. 74-29341

The numerical solution of steady, three-dimensional, inviscid, supersonic flows is applied to the calculation of the Magnus force on spinning cones at angle of attack. The Magnus force is made up of several contributions; the asymmetrical boundary layer displacement thickness contribution is considered here. Laminar boundary layer solutions for the spinning cone were obtained from a separate source. These solutions provided the two-dimensional displacement thickness information necessary to solve Moore's equation for the three-dimensional displacement thickness. The Magnus (side) force and moment coefficients were calculated by solving the complete flow field over body shapes obtained by adding the three-dimensional displacement thickness to the cone radius. The Magnus coefficients are compared with previous analytical estimates, and good qualitative agreement is shown. Dissert. Abstr.

N75-22611 University of Southern Calif., Los Angeles.
INITIAL FLOW OVER IMPULSIVELY STARTED CIRCULAR CYLINDER Ph.D. Thesis
Moshe Bar-Lev 1974 173 p
Avail: Univ. Microfilms Order No. 75-6398

A flow model simulates the flow around the cylinder. The model is made up of two vortices trailing behind a circular cylinder in a uniform flow. The flow is considered potential. The vorticity gain in the two vortices is equated to the vorticity generated within the boundary layer by using the boundary layer solutions. Formulation is presented and the computation carried out numerically and compared to experiments. A perturbation solution to the flow around an impulsively started circular cylinder is described by the matched asymptotic expansion, carried out to the third term. The flow properties were derived and plotted. Pade approximants were used in an attempt to improve the results. The Pade approximants are very close to the third expansion solutions. Dissert. Abstr.

N75-22612 California Univ., Los Angeles.
NON-CLASSICAL THERMOMECHANICAL CONVECTION IN SUPERFLUID LIQUID HELIUM 2 Ph.D. Thesis
Ravnesh Chander Amar 1974 151 p
Avail: Univ. Microfilms Order No. 75-5702

Nonclassical phenomena in superfluid He 2 in the presence of thermomechanical driving forces are investigated. The peak heat flux, q, at which vaporization initiates at the heated surface of a horizontal gallium cylinder (d = 0.12 cm) immersed in a bath of liquid He 2 (resulting in enhanced thermal impedances) is measured for various immersion depths. The peak heat fluxes q of the order of magnitude 0.1-3 watt/sq cm are one order of magnitude higher than the peak nucleate boiling fluxes in He 1. Dissert. Abstr.

N75-22613 Florida State Univ., Tallahassee.
THE EFFECT OF ROTATION ON TURBULENT CONVECTION AT INFINITE PRANDTL NUMBER Ph.D. Thesis
Nourollah Riahi 1974 88 p
Avail: Univ. Microfilms Order No. 75-7300

Upper bounds on the Nusselt number N for turbulent convection at infinite Prandtl number were obtained by two different methods. The basic equations are derived from a variational principle using two differential constraints derived from the momentum equation, the continuity equation, and an integral constraint derived from the heat equation. Singular perturbation techniques were used, treating the Rayleigh number R as a large parameter, for different ranges of the Taylor number Ta. The two different methods give the same results. Dissert. Abstr.

N75-22614 Maryland Univ., College Park.
DRAG FORCE ON OBJECT IN THE NEARLY FREE MOLECULAR FLOW REGIME AS A FUNCTION OF SPEED RATIO Ph.D. Thesis
Yuh-ying Lin Wang 1974 148 p
Avail: Univ. Microfilms Order No. 75-7373

The drag coefficient CD of an object moving in a rarefied gas can be expanded in terms of the inverse Knudsen number. The term CO represents the drag coefficient in the free molecular flow limit. The coefficient C1 is determined by a set of well defined collision integrals associated with sequences of successive collisions among two molecules and the object. These collision integrals are analyzed and evaluated for a disk and a sphere assuming that the gas molecules are reflected diffusively by the object. The molecules are treated as hard spheres, and the drag coefficient is studied as a function of the velocity of the object. The Boltzmann equation is frequently replaced with the so called BGK model equation. For the sake of comparison, the drag force on a sphere at low velocities is also evaluated in the BGK approximation. Dissert. Abstr.

N75-22615 Polish Academy of Sciences, Warsaw.
STEADY LAMINAR FLOW OF A VISCOUS INCOMPRESSIBLE FLUID BETWEEN REGULARLY THINLY SPACED SPHERES [USTALONY LAMINARNY PRZEPLYW PLYNU LEPKIEGO NIESCISLIWEGO MIEDZY REGULARNIE RZADKO ROZMIESZCZONYMI KULAMI]
Andrzej Szaniawski and Marian Biernacki 1974 25 p refs In POLISH
Avail: Issuing Activity

Methods of determining the flow field parameters (velocity and pressure) and the resulting averaged magnitudes of velocity were investigated which can be utilized for the analysis of suspension flow. Steady flow (in a regular network of spheres), cubic array of spheres, hydrodynamic equations, and circular spheres are also discussed. Transl. by M.J.S.

N75-22616 Washington State Univ., Pullman.
APPLICATION OF AVERAGED EQUATIONS TO ANALYSIS OF DROPLET-GAS FLOW FIELDS Ph.D. Thesis
Keith Randolf Crowell 1974 128 p
Avail: Univ. Microfilms Order No. 75-7631

A continuum approach, using averaged conservation equations, is used to study several problems in two phase flow. The basic equations are those derived by Drew in his 1970 Ph.D. thesis at Rensselaer Polytechnic Institute. These equations are extended and applied to three specific problems: (1) one dimensional flow of evaporating spherical droplets with velocity equilibrium between the phases; (2) one dimensional flow of evaporating droplets without velocity equilibrium; and (3) two phase flow of small spherical droplets past a large sphere. Dissert. Abstr.

N75-22617 Cincinnati Univ., Ohio.
FINITE-DIFFERENCE SOLUTIONS OF THE TURBULENT INTERACTING SUPERSONIC BOUNDARY-LAYER EQUATIONS, INCLUDING SEPARATION EFFECTS Ph.D. Thesis
Stephen Donald Bertke 1975 215 p
Avail: Univ. Microfilms Order No. 75-7676

A numerical algorithm is presented for the solution of the two dimensional, supersonic interacting turbulent boundary layer equations, including separation effects. The classical boundary layer equations are presented in Levy-Lees variables. Representative eddy viscosity models are given, and their limitations in the current problem with reversed flow are discussed. The supersonic inviscid flow is described by the usual isentropic flow relations, and an interaction model is presented wherein the boundary layer equations may be solved simultaneously with inviscid flow. In this model, the inviscid pressure at the edge of the boundary layer is determined by the displacement body, which contains a term proportional to the boundary layer displacement thickness.

The refinement of the solution brought about by this interaction term is necessary to remove an artificial singularity encountered by the classical boundary layer equations near the separation point. Dissert. Abstr.

N75-22618 Cornell Univ., Ithaca, N.Y.
EXACT FORMULAS FOR THE ELECTRICAL RESISTIVITY; HEATING OF AN ELECTRON GAS BY AN ELECTRIC FIELD: A LONG TIME SCALE PERTURBATION SOLUTION OF THE BOLTZMANN EQUATION Ph.D. Thesis
Mark Lee Huberman 1975 137 p
Avail: Univ. Microfilms Order No. 75-8597

Exact formulas for electrical resistivity are derived and the proof of the equivalence of the formulation with the linear response theory formula for electrical conductivity is given. The resistivity formula, in the limit of weak scattering, for a system of independent electrons scattered by random fixed impurities was evaluated. It was shown that the lowest order term in the expansion of the resistivity formula in the scattering potential does not agree with the Boltzmann equation, except in the case where the equilibrium electron distribution is a Fermi distribution at T = 0 K. Data also show that the correct evaluation of the resistivity formula in the limit of weak scattering involves the summation of an infinite series of divergent terms in the expansion of the resistivity formula, and that, in fact, in the limit of weak scattering, the resistivity formula is in agreement with the Boltzmann equation. A perturbation solution for the time evolution of the electron distribution of a system of independent electrons, scattered elastically by random fixed impurities in the presence of a uniform and constant electric field, is given. Dissert. Abstr.

N75-22619 Clemson Univ., S.C.
EFFECTS OF DRAG REDUCTION OF MIXTURES OF HIGH POLYMER ADDITIVES IN DISTILLED WATER FLOWING IN STRAIGHT CIRCULAR TUBES Ph.D. Thesis
Robert Edgar Hammett 1974 179 p
Avail: Univ. Microfilms Order No. 75-11505

The effect of blends of homologous polymers on the onset of drag reduction was examined. Blends of polymer grades and friction factor values were obtained using tubes of 0.081, 0.180 and 1305 inch in diameter with a length-diameter ratio of approximately 120 to 180. The blends were prepared with four grades of polyethylene oxide polymers and one grade of Separan AP-30 and the results are compared to the individual grades. Friction factor data was collected for Reynolds numbers of approximately 1000 to approximately 30,000. Results show that the entrance conditions to the test section and the distribution of the molecular weight is very important to the resultant degree of friction reduction. A method for determining the maximum available drag reduction for the polymer blends is presented, and a method was devised to super-impose the friction factor data obtained in various pipe sizes for polymers of a similar molecular distribution. Dissert. Abstr.

N75-22620 Institut d'Aeronomie Spatiale de Belgique, Brussels.
EFFUSION OF IONS THROUGH SMALL HOLES
E. Arijs 1974 24 p refs Submitted for publication
(Aeronomica-Acta-A-124-1974) Avail: Issuing Activity

The effusion of ions through small holes with cylindrical geometry in conductive materials was investigated theoretically; it was assumed that each ion striking the wall is converted into a neutral particle and that the mean free path is larger than the dimensions of the holes. Results of the calculations are compared with some preliminary experimental results. It is shown that Mayer relation must be replaced by a relation which takes into account the loss of ions by discharging effects on the inner walls of the cylindrical holes if the ion velocity is isotropic. If mass motion of ions is occurring towards the sampling orifice, a numerical treatment is necessary to describe the effusion. ESRO

N75-22621*# Houston Univ., Tex.
SILVERTON CONFERENCE ON APPLICATIONS OF THE ZERO GRAVITY SPACE SHUTTLE ENVIRONMENT TO PROBLEMS IN FLUID DYNAMICS
Melvin Eisner, ed. 1974 23 p Conference held at Silverton, Colo., 6-8 Nov. 1974
(Contract NAS9-14316)
(NASA-CR-141760) Avail: NTIS HC $3.25 CSCL 20D

The possible utilization of the zero gravity resource for studies in a variety of fluid dynamics and fluid-dynamic related problems was investigated. A group of experiments are discussed and described in detail; these include experiments in the areas of geophysical fluid models, fluid dynamics, mass transfer processes, electrokinetic separation of large particles, and biophysical and physiological areas. M.J.S.

N75-22622*# Kanner (Leo) Associates, Redwood City, Calif.
MEASUREMENT OF THE PARAMETERS OF GAS-SOLID PARTICLE FLOWS BY OPTICAL METHODS
A. Rozenshteyn Washington NASA May 1975 13 p refs Transl. into ENGLISH from Izv. Akad. Nauk Est. SSR, Fiz. Mat.(Estonian SSR), v. 23, no. 4, 1974 p 384-390
(Contract NASw-2481)
(NASA-TT-F-16320) Avail: NTIS HC $3.25 CSCL 20D

Mathematical relations are derived for obtaining local-number concentration or mass concentration of particles in two-phase flows from optical measurements based on intensity dependence of scattered light on the properties of the scattering medium. Relations are also obtained for calculating the slip velocity of particles in a gas flow from laser Doppler measurements. Author

N75-22623*# Kanner (Leo) Associates, Redwood City, Calif.
UNSTEADY MOTION OF A THIN FOIL IN AN INCOMPRESSIBLE FLUID
D. Homentcovschi Washington NASA May 1975 12 p refs Transl. into ENGLISH from Stud. Cercet. Mat. (Romania), v. 26, no. 4, 1974 p 537-544
(Contract NASw-2481)
(NASA-TT-F-16300) Avail: NTIS HC $3.25 CSCL 20D

The unsteady motion of an incompressible viscous fluid past a thin foil, using the hydrodynamic equations written in terms of distributions as the point of departure was examined. It is shown that such a procedure makes it possible to avoid reliance on Birnbaum's hypothesis regarding the continuous separation of vortices at the trailing edge of the foil. Instead, a small perturbation hypothesis is made, which makes it possible to linearize the equations of motion and the boundary conditions and to use these on the projection of the foil on the x-axis. Author

N75-22624*# Kanner (Leo) Associates, Redwood City, Calif.
MEASUREMENT OF PRESSURE IN TURBOMACHINE IMPELLERS AT HIGH ROTATIONAL VELOCITIES
I. M. Korshin Washington NASA May 1975 6 p refs Transl. into ENGLISH from Tr. KAI. (Kazan), issue 156, 1973 p 17-20
(Contract NASw-2481)
(NASA-TT-F-16292) Avail: NTIS HC $3.25 CSCL 20D

Some considerations are given for realizing effective hydrodynamic sealing of turbine shafts in order to permit pressure measurements. Measurements are made with the aid of either mechanical or electrical pressure sensors at very high revolutions per minute. The use of a water jacket for cooling the sensors is discussed. Author

N75-22625# Joint Publications Research Service, Arlington, Va.
CHARACTERISTICS OF SUBMERGED TURBULENT JETS IN NON-HOMOGENEOUS FLUIDS
Yu. D. Chashechkin 29 Apr. 1975 7 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Fiz. Atmos. Okeana, (Moscow), no. 12, 1974 p 1331-1333
(JPRS-64645) Avail: NTIS HC $3.25

Taking into consideration equations of motion and boundary conditions, the following parameters are discussed: the characteristic dimension d of the source, the characteristic velocity, the density of the fluid, dynamic viscosity, acceleration g of gravity, and the scale of the density variation in an undisturbed medium. Other topics discussed include the Reynolds number, Froude number, energy spectra, and atmospheric turbulence. M.J.S.

N75-22626*# Sybucon, Inc., Atlanta, Ga.
CALCULATIONS OF UNSTEADY TURBULENT BOUNDARY LAYERS WITH FLOW REVERSAL

J. F. Nash and V. C. Patel Washington NASA May 1975 55 p refs Prepared for Army Air Mobility R and D Lab., Moffett Field, Calif.
(Contract NAS2-7724)
(NASA-CR-2546) Avail: NTIS HC $4.25 CSCL 20D

The results are presented of a series of computational experiments aimed at studying the characteristics of time-dependent turbulent boundary layers with embedded reversed-flow regions. A calculation method developed earlier was extended to boundary layers with reversed flows for this purpose. The calculations were performed for an idealized family of external velocity distributions, and covered a range of degrees of unsteadiness. The results confirmed those of previous studies in demonstrating that the point of flow reversal is nonsingular in a time-dependent boundary layer. A singularity was observed to develop downstream of reversal, under certain conditions, accompanied by the breakdown of the boundary-layer approximations. A tentative hypothesis was advanced in an attempt to predict the appearance of the singularity, and is shown to be consistent with the calculated results. Author

N75-22627*# Martin Marietta Corp., Denver, Colo.
FINITE ELEMENT SOLUTION OF LOW BOND NUMBER SLOSHING Final Report
Richard L. Wohlen, A. Colton Park, and David M. Warner Apr. 1975 123 p refs
(Contract NAS8-29946)
(NASA-CR-120299; MCR-75-139) Avail: NTIS HC $5.25 CSCL 20D

The dynamics of liquid propellant in a low Bond number environment which are critical to the design of spacecraft systems with respect to orbital propellant transfer and attitude control system were investigated. Digital computer programs were developed for the determination of liquid free surface equilibrium shape, lateral slosh natural vibration mode shapes, and frequencies for a liquid in a container of arbitrary axisymmetric shape with surface tension forces the same order of magnitude as acceleration forces. A finite volume element representation of the liquid was used for the vibration analysis. The liquid free surface equilibrium shapes were computed for several tanks at various contact angles and ullage volumes. A configuration was selected for vibration analysis and lateral slosh mode shapes and natural frequencies were obtained. Results are documented. Author

N75-22628*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Aerospace and Ocean Engineering.
HYPERSONIC IONIZING AIR VISCOUS SHOCK-LAYER FLOWS OVER NONANALYTIC BLUNT BODIES
E. W. Miner and Clark H. Lewis Washington NASA May 1975 111 p refs
(Contract NAS9-12630)
(NASA-CR-2550) Avail: NTIS HC $5.25 CSCL 20D

The equations which govern the viscous shock-layer flow are presented and the method by which the equations are solved is discussed. The predictions of the present finite-difference method are compared with other numerical predictions as well as with experimental data. The principal emphasis is placed on predictions of the viscous flowfield for the windward plane of symmetry of the space shuttle orbiter and other axisymmetric bodies which approximate the shuttle orbiter geometry. Experimental data on two slender sphere-cones at hypersonic conditions are also considered. The present predictions agreed well with experimental data and with the past predictions. Substantial differences were found between present predictions and more approximate methods. Author

N75-22629# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
INVESTIGATION OF SECONDARY FLOW BEHAVIOR AND END WALL BOUNDARY LAYER DEVELOPMENT THROUGH COMPRESSOR CASCADES
John W. Salvage Jun. 1974 239 p refs
(TN-107) Avail: NTIS HC $7.50

The three-dimensional performance of plane compressor cascades with colateral inlet wall boundary layers was investigated to formulate a viscous model to describe the flows. The fundamental phenomena influencing the flow field, particularly its viscous behavior, were studied along with the global performance, and end wall boundary layer with the blade passage. One fundamental result of the investigation shows that the passage vortex must be a result of inviscid flow phenomena, since it does not lead to significant additional loss. Another fundamental result is that the passage vortex primarily controls the spanwise distribution of the outlet flow angle. It is shown that secondary flow effects attributed to low aspect ratio blading are also observed at the aspect ratio when the inlet end wall boundary layer is sufficiently thick or main stream turning is large, and passage vortex is the mechanism which creates effectively low aspect ratio conditions by redistributing low energy boundary layer material. The global loss in total pressure for a cascade in three-dimensional flows is primarily dependent upon the actual behavior of the flow at midspan. Author

N75-22630*# Geoscience, Ltd., Solana Beach, Calif.
TECHNOLOGY OF FORCED FLOW AND ONCE-THROUGH BOILING: A SURVEY Technology Utilization
Heinz F. Poppendieck and Cullen M. Sabin Washington NASA 1975 311 p refs Sponsored by NASA
(NASA-SP-5102) Avail: NTIS HC $9.25 CSCL 20D

Representative boiling heat transfer and pressure drop information obtained primarily from past NASA and AEC programs is presented which is applicable to forced flow and once-through boiler systems. The forced convection boiler has a number of advantages: little possibility of flow mal-distribution; heat transfer characteristics are usually consistent; and conductances are predictable, so that higher heat fluxes may be employed with safety (which leads to more compact, lighter weight equipment). It was found that in gas-fired systems particularly, the controlling heat transfer resistance may be on the hot side, so that increased fluxes would require extended surfaces. If in a power generation system the working fluid is very expensive, a forced flow boiler can be designed especially for small holdup volume. If the fluid is temperature sensitive, the boiling side wall temperatures can be tailored to maintain maximum heat transfer rates without overheating the fluid. The forced flow and once-through configurations may be the only type which can satisfy a specific need (such as the automotive Rankine cycle power plant design having a very short time-response boiler). Author

N75-22631# Pisa Univ. (Italy).
CHARACTERISTIC COEFFICIENTS OF DIVERSE SHAPED HYDROSTATIC BEARINGS [COEFFICIENTI CARATTERISTICI DI PATTINI IDROSTATICI DI FORME DIVERSE]
R. Bassani and C. Culla 1974 26 p refs In ITALIAN
(Rept-45) Avail: NTIS HC $3.75

A series of data is presented concerning the characteristic coefficient value of the load capacity of fluid flow, and potential dissipated by hydrostatic bearing of various shapes. These high precision values, obtained by numerical calculations, are presented as functions of the bearing geometry. Transl. by F.O.S.

N75-22632# Aeronautical Research Inst. of Sweden, Stockholm.
THE SOLUTION OF THE LAMINAR AND TURBULENT THREE DIMENSIONAL BOUNDARY LAYER EQUATIONS WITH A SIMPLE FINITE DIFFERENCE TECHNIQUE
T. K. Fanneloep and D. A. Humphreys 1975 82 p refs
(FFA-126) Avail: NTIS HC $4.75

The three dimensional boundary layer equations were solved numerically using an implicit finite difference scheme. Turbulent flow is modelled with an eddy viscosity. Efficient procedures available for two dimensional calculations were used and computer programming effort and comparable execution times were required. Two model flows and one experimental flow, all of the infinite wing variety, are presented and show that the method performs satisfactorily. Suggestions for further applications are included. Author

N75-22633# Atomic Energy Commission, Washington, D.C.
MEASUREMENTS IN DISPERSED FLOWS
B. I. Leonchik and V. P. Mayakin 1971 236 p refs Transl. into ENGLISH of a Russian book
(AEC-TR-7600) Avail: NTIS HC $7.50

Methods, devices, and circuits for measurement in dispersed flows are examined with emphasis on measurements with the goal of controlling and studying technological heat and mass

exchange apparatus. The capacities and existing means of measuring the dispersed composition of particles, velocities, concentrations, and temperatures of phases are indicated. Methods of analytically describing the transfer of heat and mass into dispersed flows are also examined. Results of measurements and calculations are cited. Author (NSA)

N75-22634# Massachusetts Inst. of Tech., Cambridge.
ANALYSIS AND CALCULATION OF SPECIES SEPARATION IN A SUPERSONIC FLOW OF A BINARY GAS MIXTURE THROUGH A CURVED SHOCK WAVE
W. L. Harris Sep. 1974 28 p refs Presented at the Workshop on Gas Dyn. Probl. in Isotope Separation, Albuquerque, N. Mex., 4 Dec. 1974 Sponsored by ERDA
(K-GD-1145; Conf-741214-2) Avail: NTIS HC $3.75

Technical accomplishments in efforts to synthesize existing theoretical models of shock wave phenomena in order to predict species separation in gas mixtures in supersonic flow through curved, two-dimensional shock waves are summarized. The results are consistent with the structure of the shock being governed by the Navier-Stokes equations. The implication being, in this case, that the flow is not rarefied. The results are not limited by mass ratio nor mole fraction of the species in the binary mixture. The species are assumed to be non-reacting (chemically inert). Author (NSA)

N75-22635# California Univ., Berkeley. Lawrence Berkeley Lab.
DYNAMICS OF VISCOUS NUCLEAR DROPS
C. T. Alonso Aug. 1974 37 p refs Presented at Intern. Colloq. on Drops and Bubbles, Pasadena, Calif., 28 Aug. 1974 (Contract W-7405-eng-48)
(LBL-2993; Conf-740837-3) Avail: NTIS HC $3.75

A dynamical description of the oscillation, fission, and fusion of classical viscous charged or gravitating liquid drops is presented. This description is generated numerically by computer simulation. The methods described are applied to problems in astrophysics, meteorology, fluid mechanics, and space science. A preliminary survey is given of drop dynamics. Included is a discussion of the applicability of the classical hydrodynamic approach to the nuclear problem. This is followed by a description of the bulk flow equations and free surface boundary conditions for a viscous charged drop. Finally some simulations of the oscillations of charged and neutral drops as a function of initial shape, charge, and viscosity are presented. Also some preliminary simulations of fissions and fusions of viscous charged drops are presented with some comments about the possible role of nuclear viscosity in the creation of superheavy elements in heavy ion accelerator experiments. Author (NSA)

N75-22636# Oak Ridge Gaseous Diffusion Plant, Tenn.
AERODYNAMIC SEPARATION SCHEMES: AN OVERVIEW
E. VonHalle 16 Dec. 1974 14 p Presented at the Workshop on Gas Dyn. Probl. in Isotope Separation, Albuquerque, N.M., 4 Dec. 1974
(Contract W-7405-eng-26)
(K-OA-2604; Conf-741214-1) Avail: NTIS

Economic requirements of aerodynamic isotope separation processes before they could replace the gaseous diffusion process are discussed. The processes include: separation nozzle, sonic impact probe or Fenn process, diffusion into a jet, crossed molecular beams, and vortex tubes. Technical data on the processes are not included. NSA

N75-22637# Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
THREE DIMENSIONAL HEATED SURFACE JET IN A CROSS FLOW
H. H. Carter and R. Regier Nov. 1974 82 p refs
(Contract AT(11-1)-3062)
(COO-3062-19; TR-88) Avail: NTIS HC $4.75

Various characteristics of three-dimensional heated surface jets in a cross flow were measured in a large, low-velocity flume. The characteristics studied were vertical growth, lateral spread, centerline trajectory, and dilution. Author (NSA)

N75-22638# Imperial Coll. of Science and Technology, London (England). Dept. of Aeronautics.
REYNOLDS NUMBER DEPENDENCE OF SKIN FRICTION IN TWO-DIMENSIONAL RECTANGULAR DUCT FLOW AND A DISCUSSION OF THE LAW OF THE WAKE
R. B. Dean Dec. 1974 56 p refs
(IC-Aero-74-11) Avail: NTIS HC $4.25

The dependence of the skin friction coefficient, duct center-line value of the mean velocity longitudinal component, and other bulk flow parameters on the Reynolds number in two-dimensional rectangular duct flow is explored and empirical relations for Cf and Uo/U are presented which cover a wide range of Reynolds numbers. Values for the log-law constants and Coles profile parameter are given which are shown to be independent of Reynolds number, and consistent with the absence of a viscous superlayer in duct flow. A critical analysis of Coles' law of the wake leads to the derivation of a new formula for the wake function which is shown to describe the details of the wake profile satisfactorily for a range of pressure gradients and flow configurations. It is argued that the Coles profile parameter will be quite strongly dependent on the Reynolds number in boundary layers exposed to favorable pressure gradients, where the influence of the viscous superlayer is believed to be much greater. ESRO

N75-22639# Laboratoire de Recherches Balistiques et Aerodynamiques, Vernon (France). Service Aerodynamique.
RECESSION VELOCITY OF AN ABLATIVE MATERIAL MEASURED IN HYPERBALLISTIC WIND TUNNEL [MESURE AU TUNNEL HYPERBALISTIQUE DE LA VITESSE DE RECESSION D'UN MATERIAU EN ABLATION]
A. Desgardin 15 Nov. 1974 16 p refs In FRENCH
(LRBA-E-828-NT-5/SAE) Avail: NTIS HC $3.25

A review of U.S. literature is carried out and the various problems related to using the hyperballistic tunnel as test chamber for high enthalpy measurements on ablative materials are discussed. The fluxes created at the tip of projectiles hurled at 5000 m/s, for a pressure of seven bars and a three mm nose cone radius is of order 6 Mw/sq cm. Along the trajectory however the flux decreases due to projectile drag. The parameters to be considered in such studies, namely, pressure and velocity, resolving power of the laser display images, and time required to initiate ablation are discussed. It is concluded that for the available trajectory length of 72 m a five bar pressure with one mm projectile radius and 5000 m/s launch velocity, would be about optimal parameters for the existing visualization devices. ESRO

N75-22640# Unilever Research, Vlaardingen (Netherlands).
APPLICATION OF LONGITUDINAL WAVE THEORY TO DESCRIBE INTERFACIAL INSTABILITY
J. H. Gouda and P. Joos [1975] 29 p refs Submitted for publication
Avail: NTIS HC $3.75

The onset of interfacial instability due to solute transfer between two immiscible liquid phases is described as the occurrence of an undamped longitudinal wave at their interface. The damping coefficient of such a wave is expressed in terms of the properties of the interface and the adjoining bulk phases, and is assumed to equal zero at the onset instability. The conditions under which the theory predicts instability are dealt with. The predictions are in fair agreement with experimental data obtained for the butanone, paraffin oil-water and for the acetic acid, ethylene glycol-ethyl acetate systems. ESRO

N75-22641# Unilever Research, Vlaardingen (Netherlands).
NON-IDEAL PHASE BEHAVIOUR OF BINARY MIXTURES OF TRIGLYCERIDES WITH MONO- AND DIGLYCERIDES
M. Knoester and D. J. DeJong [1975] 21 p refs Submitted for publication
Avail: NTIS HC $3.25

Non-ideal miscibility in the liquid phase of mono- or diglycerides with triglycerides is described in terms of thermodynamic excess functions. The heat of mixing and the solubility temperatures of several ideal and non-ideal binary glyceride mixtures are measured. The non-ideal phase behavior of glyceride systems reported in the literature is satisfactorily predicted, which indicates that the excess functions are generally applicable to mixtures of mono- or diglycerides with triglycerides.
Author (ESRO)

N75-22642# Michigan Univ., Ann Arbor. Dept. of Mechanical Engineering.
EFFECTS OF MAGNETIC AND ELECTRIC FIELDS UPON CAVITATION IN CONDUCTING AND NONCONDUCTING LIQUIDS. RUSSIAN RESEARCH RESULTS
F. G. Hammitt Dec. 1974 11 p refs
(Grant NSF GK-1889)
(PB-238449/3; UMICH-01357-30-I) Avail: NTIS HC $3.25 CSCL 20D

Recent results, primarily of Russian origin, indicate various effects upon cavitation damage and individual bubble dynamics in both non-conducting (water) and conducting liquids (liquid metals) of external magnetic and electric fields. Recent tests at the University of Michigan in tap water, salted water, and mercury are compared for the effects of a 6 kilogauss magnetic field upon nucleation threshold in a vibratory cavitation experiment. Possible mechanisms are discussed. GRA

N75-22643# Michigan Univ., Ann Arbor. Cavitation and Multiphase Flow Lab.
EFFECTS OF MAGNETIC AND ELECTRIC FIELDS UPON CAVITATION IN CONDUCTING AND NON-CONDUCTING LIQUIDS
F. G. Hammitt, E. Yilmaz, O. Ahmed, N. R. Bhatt, and J. Mikielewicz Dec. 1974 12 p refs Presented at the 1975 ASME Polyphase Flow Forum
(Grant NSF GK-1889)
(PB-238656/3; UMICH-01357-30-I) Avail: NTIS HC $3.25 CSCL 20D

Results, primarily of Russian research over the last 5 year period, indicating various effects of magnetic and electric fields upon cavitation in both conducting and non-conducting liquids, are reviewed. Measurable effects, particularly upon cavitation damage, appear to exist for all the above cases. However, tests upon cavitation threshold in salted and tap water, and also in mercury indicate no effect of a 6kG magnetic field. GRA

N75-22644# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ONE CLASS OF PLANE STATIONARY IRROTATIONAL FLOW WITH BOUNDARIES
I. L. Barskii 18 Feb. 1975 30 p refs Transl. into ENGLISH from Uch. Zap. Tsentr. Aerogidrodinamicheskii Inst. (USSR), v. 2, no. 3, 1971 p 84-89
(AD-A007239; FTD-MT-24-0576-75) Avail: NTIS CSCL 20/4

Solutions are presented to Euler equations for stationary plane flow of an ideal incompressible fluid flow with a Kirchhoff nucleus. Diagrams are given of the symmetric flow about a plate or wedge with free boundaries. Other topics discussed include limits, flow characteristics, analytic functions, flat plates, mathematical models, and cavitation flow. M.J.S.

N75-22645# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ONE METHOD OF THE NUMERICAL SOLUTION OF THE EQUATIONS OF NAVIER-STOKES THE COMPRESSIBLE GAS
A. I. Tokstykh 6 Feb. 1975 36 p refs Transl. into ENGLISH from Uch. Zap. Tsentr. Aerogidrodinamicheskii Inst. (USSR), v. 3, no. 6, 1972 p 78-87
(AD-A007238; FTD-MT-24-0519-75) Avail: NTIS CSCL 20/4

The flow about blunted bodies with a sufficiently large Reynolds number was investigated along with the flow in shock waves. Other topics discussed include compressible flow, viscous flow, and equations of motion. M.J.S.

N75-22646# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
CALCULATION OF THREE DIMENSIONAL LAMINAR BOUNDARY LAYER IN A NONCOMPRESSIBLE LIQUID BY METHOD OF INTEGRAL RELATIONSHIPS
V. A. Barinov 29 Jan. 1975 27 p refs Transl. into ENGLISH from Uch. Zap. Tsentr. Aerogidrodinamicheskii Inst. (USSR), v. 4, no. 1, 1973 p 10-16
(AD-A007237; FTD-MT-24-0494-75) Avail: NTIS CSCL 20/4

Integral equations are derived for these boundary layers, and the finite difference theory is included. Friction coefficients are given for several velocity distributions on the sliding wing wall. M.J.S.

N75-22647# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
STUDY OF THE FLOW BEFORE THE SPHERE, PLACED IN THE TRACE OF BODY, DURING SUPERSONIC FLOW
V. S. Khlebnikov 5 Feb. 1975 24 p refs Transl. into ENGLISH from Uch. Zap. Tsentr. Aerogidrodinamicheskii Inst. (USSR), v. 2, no. 1, 1971 p 42-48
(AD-A007231; FTD-MT-24-0387-75) Avail: NTIS CSCL 20/4

Supersonic flow is discussed along with reattached flow during changes in the distances between conical bodies. Other topics discussed include pressure distribution, heat flux measurements, supersonic wind tunnels, heat transfer, wakes, and flow distribution. M.J.S.

N75-22648# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE THERMODYNAMIC PERFECTION OF FLOWS FROM TEPLO BY MASSOPODVODOMIN CHANNELS AT SUPERSONIC GAS VELOCITY AT ENTRANCE
R. G. Leonova 24 Jan. 1975 19 p refs Transl. into ENGLISH from Uch. Zap. Tsentr. Aerogidrodinamicheskii Inst. (USSR), v. 1, no. 5, 1970 p 94-97
(AD-A007230; FTD-MT-24-0364-75) Avail: NTIS CSCL 20/4

Conditions were examined which determine the minimum losses in heat and mass supply for the gas which flows in channels at initial supersonic speed. It was shown that it is thermodynamically expedient to relate heat and mass supply either directly to supersonic flow or to subsonic flow obtained during the passage of the gas through shock waves. M.J.S.

N75-22649# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
EXPERIMENTAL STUDY OF THE NONEQUILIBRIUM FLOW OF GAS, EXCITED BY HIGH FREQUENCY DISCHARGE
A. S. Bushmin and B. G. Efimov 27 Jan. 1975 17 p refs Transl. into ENGLISH from Uch. Zap. Tsentr. Aerogidrodinamicheskii Inst. (USSR), v. 2, no. 6, 1971 p 112-115
(AD-A007195; FTD-MT-24-0450-75) Avail: NTIS CSCL 20/4

The results are presented of experimental studies of supersonic low density flow in a low pressure wind tunnel with a high frequency preheater. The spectral composition of gas in the discharge chamber and in the stream behind the nozzle was investigated along with the change in the oscillatory temperature. Other topics discussed include rarefied gases, heat transfer coefficients, temperature distribution, radiation spectra, and equilibrium flow. M.J.S.

N75-22650# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
EXPERIMENTAL STUDY OF HYPERSONIC JETS WITH THE AID OF HOT-WIRE ANEMOMETER
V. N. Gusev, Y. V. Nikolskii, and L. G. Chernikov 4 Feb. 1975 25 p refs Transl. into ENGLISH from Uch. Zap., Tsent. Aerogidrodinamicheskii Inst. (USSR), v. 3, no. 5, 1972 p 33-39
(AD-A007199; FTD-MT-24-0534-75) Avail: NTIS CSCL 20/4

Investigations were carried out under hypersonic aerodynamic conditions such as vacuum, impact, and helium ducts. A method was proposed for determining the flow parameters by measuring heat flux (to the filament of the hot-wire anemometer) and the stagnation pressure. Rarefied gas dynamics are also discussed. M.J.S.

N75-22651# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE TEMPERATURE BOUNDARY CONDITION IN THE PROBLEM OF BOUNDARY LAYER STABILITY
V. A. Kuzminskii 9 Jan. 1975 23 p refs Transl. into ENGLISH from Uch. Zap. Tsentr. Aerogidrodinamicheskii Inst. (USSR), v. 4, no. 2, 1973 p 97-102
(AD-A007180; FTD-MT-24-286-75) Avail: NTIS CSCL 20/4

A diagram of heat exchange between fairing and gas in a boundary layer was examined, boundary conditions were obtained for temperature fluctuations in the linear problem of laminar flow stability. The performance calculation of the maximum

stability characteristics of laminar boundary layers on cooled flat/plane plates at supersonic flow velocities was examined. M.J.S.

N75-22652# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

MOTION OF RAREFIED GAS IN A DUCT WITH FLOW RATE VARIABLE FOR LENGTH

Yu. E. Kuznetsov 15 Jan. 1975 10 p refs Transl. into ENGLISH from Uch. Zap. Tsentr. Aerogidrodinamicheskii Inst. (USSR), v. 3, no. 5, 1972 p 102-103

(AD-A007181; FTD-MT-24-297-75) Avail: NTIS CSCL 20/4

The Knudsen-Smolukhovskiy formula is derived for the case of free molecular flow of a rarefied gas in a round cylindrical pipe with constant flow rate. Molecular properties, mathematical models, equations of motion, and pressure gradients are also discussed. M.J.S.

N75-22653# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

EXTERNAL HEAT SUPPLY IN A DETONATION WAVE

V. G. Bukovshin and G. I. Taganov 8 Jan. 1975 12 p refs Transl. into ENGLISH from Uch. Zap. Tsentr. Aerogidrodinamicheskii Inst. (USSR), v. 1, no. 5, 1970 p 87-88

(AD-A007103; FTD-MT-24-259-75) Avail: NTIS CSCL 20/4

The problem of hypersonic flow about the double wedge airfoil with an external heat supply in a detonation wave was investigated. It is found that the correct amount of boundary conditions for the flow leads to an essential decrease in the thrust. Other topics discussed include supersonic flow, lift, mathematical models, and heat transfer. M.J.S.

N75-22654# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.

NON-PARALLEL STABILITY OF BOUNDARY LAYER FLOWS

Ali H. Nayfeh and William S. Saric Feb. 1975 27 p refs Prepared in cooperation with Sandia Labs., Albuquerque, N. Mex.

(Contract N00014-72-A-0136-0002; NR Proj. 061-201)

(AD-A006918; VPI-E-75-5) Avail: NTIS CSCL 20/4

The spatial stability of two-dimensional incompressible boundary-layer flows is analyzed by using the method of multiple scales. The analysis takes into account the streamwise variations of the mean flow, the disturbance amplitude, and the wavenumber. The theory is applied to the Blasius and the Falkner-Skan flows. For the Blasius flow, the non-parallel analytical results are in good agreement with the experimental data. The results show that the non-parallel effects increase as the pressure gradient decreases. GRA

N75-22655# Mount Auburn Research Associates, Inc., Newton Upper Falls, Mass.

A NUMERICAL MODEL OF DROPLET ENTRAINMENT FROM A CONTAINED OIL SLICK Final Report

Robert G. Zalosh Sep. 1974 83 p refs

(Contract DOT-CG-41822-A)

(AD-A006600; USCG-D-65-75) Avail: NTIS CSCL 20/4

A theoretical analysis of oil droplet entrainment from a contained oil slick moving relative to water has been performed as a function of relative oil-water velocity. A numerical method incorporating discrete vortices is used to calculate smooth stable headwave profiles at low velocities and unstable profiles at high velocities. An oil droplet formation criterion is formulated and applied to the numerically modeled headwave region. The computed critical velocity corresponding to the onset of significant droplet entrainment is in close agreement with recent laboratory measurements. The computed entrainment rates are in approximate agreement with experiment, but do not exhibit systematic variation with water current. Oil drop trajectories are calculated using realistic starting conditions, but the present work does not extend beyond the first intersection of the drop with the slick. Recommendations are given for extending the work to include: post-formation droplet dynamics, wave effects, turbulence effects, and barrier design changes. GRA

N75-22656# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

STUDY OF UNSTEADY FLOW IN A POROUS MEDIUM UNDER THE INFLUENCE ON ITS SURFACE OF HOT SUPERSONIC JET

V. I. Garkusha 15 Jan. 1975 25 p refs Transl. into ENGLISH from Uch. Zap. Tsentr. Aerogidrodinamicheskii Inst. (USSR), v. 4, no. 2, 1973 p 103-107

(AD-A007186; FTD-MT-24-0287-75) Avail: NTIS CSCL 20/4

The results are presented of a numerical study of unsteady gas flow under the action of hot supersonic jets on its surface. The specified distribution of surface pressure and heat transfer coefficients are given along with the pressure and temperature distribution in the porous media. Other topics discussed include soil science, laminar flow, finite difference theory, specific heat, and soil-jet interactions. M.J.S.

N75-22657# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

ONE APPROXIMATE METHOD FOR CALCULATING THE AERODYNAMIC CHARACTERISTICS OF SMOOTH BODIES, STREAMLINED AT DIFFERENT ANGLES OF ATTACK BY A SUPERSONIC FLOW OF GAS

V. F. Syagaev and N. A. Makhin 17 Jan. 1975 23 p refs Transl. into ENGLISH from Uch. Zap., Tsentr. Aerogidrodinamicheskii Inst. (USSR), v. 2, no. 5, 1971 p 116-121

(AD-A006693; FTD-MT-24-0318-75) Avail: NTIS CSCL 20/4

An approximation method of equivalent cones is examined for the calculation of the aerodynamic characteristics of smooth bodies in a supersonic flow of gas. GRA

N75-22658# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

TEMPERATURE BOUNDARY LAYER WITH WALL TEMPERATURE SINUSOIDALLY CHANGING ALONG SURFACE

V. A. Barinov and A. V. Zubtsov 9 Jan. 1975 14 p Transl. into ENGLISH from Uch. Zap., Tsentr. Aerogidrodinamicheskii Inst. (USSR), v. 2, no. 2, 1971 p 87-89

(AD-A006697; FTD-MT-24-271-75) Avail: NTIS CSCL 20/4

During cooling or heating of a body immersed in fluid flow, the distribution of temperature on its surface can turn out to be nonuniform. The work examines the case of the flow of an incompressible fluid about the body, when upon the average value of the temperature of the wall sinusoidal temperature variations are superimposed with a short wavelength. The characteristics of the dynamic boundary layer are assumed to be known. GRA

N75-22659# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

FLOW OF A TWO-PHASE MEDIUM WITH SOLID PARTICLES PAST A THIN PROFILE

N. A. Mamadaliev and Kh. A. Rakhmatulin 7 Jan. 1975 13 p refs Transl. into ENGLISH from the book "Volny v Neuprugikh Sredakh" Kishinev, Izd vo AN MSSR, 1970

(AD-A006857; FTD-MT-24-2735-74) Avail: NTIS CSCL 20/4

The problem of a supersonic flow of a barotropic medium with solid particles past a profile in which the elastic collision of the particles against the surface of the profile is considered has practical significance in calculating the parameters of the stream which flows from a supersonic nozzle, the flight of bodies in gas-dust media, etc. The authors have examined the problem of the impact of particles against a wedge for a negligibly small volume of particles. Presented is a model of a two-phase medium flowing past a thin shape. GRA

N75-22660# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

FLOW IN A CHANNEL WITH THE LONGITUDINAL SLOT

M. A. Alekseev, V. A. Barinov, and I. P. Malyshev 18 Feb. 1975 23 p refs Transl. into ENGLISH from Uch. Zap. Tsagi (USSR), v. 2, no. 3, 1971 p 90-94

(AD-A007240; FTD-MT-24-0577-75) Avail: NTIS CSCL 20/4

Numerical calculations of channel flow are given along with the derivation of equations for this flow. The effect was investigated of external pressure, friction, and dimensional characteristics of slots and channels on the uniformity of air suction through the slot. M.J.S.

N75-22661# Massachusetts Inst. of Tech., Cambridge. Dept. of Ocean Engineering.
HYDRODYNAMICS OF A BODY OF REVOLUTION WITH FAIRWATER AND RUDDERS AT A CONSTANT ANGLE OF ATTACK Final Report, Oct. 1971 - Mar. 1974
Joseph Luckard, Jr. Mar. 1974 196 p refs
(Contract N00014-67-A-0204-0058)
(AD-A001750; OE-74-8) Avail: NTIS CSCL 13/10

An investigation is made of the hydrodynamic forces and moments on a submerged body of revolution, resulting from the addition of an asymmetric fairwater and hull-control surfaces, and the results of their interaction. Experimental, flow visualization, numerical, and analytical approaches are described. GRA

N75-22662# Massachusetts Inst. of Tech., Cambridge. Dept. of Ocean Engineering.
EXPERIMENTS ON RUDDERS WITH SMALL FLAPS IN FREE-STREAM AND BEHIND A PROPELLER
Justin E. Kerwin, S. Dean Lewis, and Bohdan W. Oppenheim Oct. 1974 157 p refs
(Contract N00014-67-A-0204-0067; NR Proj. 062-467)
(AD-A002280; OE-74-16) Avail: NTIS CSCL 20/4

Water tunnel experiments were performed to determine the characteristics of rudders with small flaps both in the free stream and behind a propeller. The results include plots of lift, drag, rudder moment, and flap moment coefficient for a complete range of angles of attack and flap deflection. GRA

N75-22663# Cincinnati Univ., Ohio. Dept. of Aerospace Engineering.
INVESTIGATION OF SMALL TURBINE AERODYNAMICS
W. Tabakoff Jan. 1975 18 p refs
(Grant DA-ARO(D)-31-124-71-G154)
(AD-A007250; ARO-10223-13-E; Rept-75-44) Avail: NTIS CSCL 13/7

The main objective of this research work was to study the following problems in association with axial flow turbomachinery: (1) Cascade losses; (2) off-design behavior for compressor; (3) erosion phenomena and solid particle trajectories; and (4) a new concept for reduction of secondary losses in small turbine quide vanes. GRA

N75-22664# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
DETERMINATION OF THE PERMISSIBLE HEAT FLOWS IN HEAT TUBES WITH CAPILLARY SYSTEM IN THE FORM OF LONGITUDINAL RECTANGULAR CHANNELS
Yu. F. Potapov 15 Jan. 1975 26 p refs Transl. into ENGLISH from Uch. Zap. Tsagi (USSR), v. 2, no. 1, 1971 p 117-121
(AD-A007191; FTD-MT-24-0394-75) Avail: NTIS CSCL 20/4

The Runge-Kutta method and numerical analysis were used to calculate permissible heat flux. An optimum ratio of the width of the channel to its height was found which ensured the maximum transferred heat flux. Other topics discussed include flux densities, channel flow, pressure gradients, mathematical models, and heat pipes. M.J.S.

N75-22665# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE EFFECT OF THE NONUNIFORMITY OF FLOW ON THE VALUE OF TOTAL IMPULSE
I. I. Mazhirov 13 Feb. 1975 23 p refs Transl. into ENGLISH from Uch. Zap. Tsentr. Aerogidrodinamicheskii Inst. (USSR), v. 2, no. 2, 1971 p 81-86
(AD-A007188; FTD-MT-24-0348-75) Avail: NTIS CSCL 20/1

It is shown that the nonuniformity of stagnation temperature and given velocity at the jet nozzle output leads to the losses of total impulse of gas jet. Combustion efficiency at nonuniform stagnation temperature was also investigated. Other topics discussed include jet flow, equations of motion, mathematical models, and nonuniform flow. M.J.S.

N75-22666# Northrop Corp., Hawthorne, Calif. Aircraft Div.
CALCULATION ON UNSTEADY TWO-DIMENSIONAL SUPERSONIC FLOW BY THE METHOD OF CHARACTERISTICS Technical Report, Mar. 1973 - Feb. 1974
C. W. Chu, H. C. Kao, and S. Nadir Oct. 1975 46 p refs
(Contract N00014-73-C-0237; NR Proj. 061-213)
(AD-A006969; NOR-74-84) Avail: NTIS CSCL 20/4

A method of characteristics for unsteady two-dimensional flow is presented herein. The method is applied to flow fields over a blunt-nosed airfoil in a supersonic free stream. The compatibility relation is derived first. Then the method of solution is presented. Three types of numerical examples are presented and discussed. The first type establishes the stability of the numerical scheme. The second type consists of the unsteady flow fields over an NACA 0024 airfoil in harmonic lunging, pulsating, and pitching motions. The third type represents application to steady flow problems and includes the calculation of the flow field over an NACA 0009 airfoil at a low supersonic speed of free stream Mach 1.2. GRA

N75-22667# Virginia Polytechnic Inst. and State Univ., Blacksburg. Coll. of Engineering.
THREE-DIMENSIONAL TURBULENT FLOW RESEARCH Final Report
F. J. Pierce Jan. 1975 11 p refs
(Contract DAHC04-67-C-0008; ARO Proj. 6858-E; DA Proj. 200-14501-B-33G)
(AD-A007246; VPI-E-75-2) Avail: NTIS CSCL 20/4

This is a final summary report on basic research in the three-dimensional turbulent flow problem area. Research in pressure driven skewed boundary layer flows included direct force measurement of local wall shear stress, mean velocity and Reynolds stress measurements in a rectangular curved channel boundary layer and in an unconfined boundary layer, and numerical solutions of both the momentum integral and motion forms of the governing equations. GRA

N75-22668# Office of Naval Research, London (England).
INTERNATIONAL CONFERENCE ON DRAG REDUCTION
Albert D. Wood 12 Dec. 1974 14 p Conf. held at Cambridge, Engl., 4-6 Sep. 1974
(AD-A006784; ONRL-C-10-74) Avail: NTIS CSCL 20/4

This report summarizes the principal papers of the Conference, covering a wide range of topics, such as: Theory of polymeric drag reduction; tests of proposed correlations and scaling theory; polymer degradation; effects of surfactants, fibers, sediments, and compliant surfaces; applications to hydrofoils, turbomachinery, flow measurement, jets; shear stress reduction in blood flow. The writer cites reasons for caution in any extrapolations with theoretically-based drag-reduction formulas, and discusses the controversy as to whether this reduction is time-scale or length-scale dependent. GRA

N75-22669# Oregon State Univ., Corvallis.
APPLIED AERODYNAMICS OF WIND POWER MACHINES
Robert E. Wilson and Peter B. S. Lissaman Jul. 1974 116 p refs
(Grant NSF GI-41840)
(PB-238595/3; NSF/RA/N-74-113) Avail: NTIS HC $5.25 CSCL 20D

Aerodynamics of various types of wind power machines, and advantages and disadvantages of various schemes for obtaining power from the wind are reviewed. Simple, one-dimensional models for various power producing machines are given along with their performance characteristics, and presented as a function of their elementary aerodynamic and kinematic characteristics. Propeller type wind turbine theory is reviewed to level of strip theory including both induced axial and tangential velocities. GRA

N75-22670# Michigan Univ., Ann Arbor. Dept. of Mechanical Engineering.
EFFECTS OF ENTRAINED PARTICLE SPECTRA ON BUBBLE NUCLEATION
F. G. Hammitt Jan. 1975 4 p
(Grant NSF GK-1889)
(PB-239297/5; UMICH-01357-33-I) Avail: NTIS HC $3.25 CSCL 20D

Bubble nucleation threshold pressures in a liquid, for either boiling or cavitation, were observed to depend very heavily upon the size, type, and number of nuclei of sites existing in the liquid. In the case of boiling, these sites are usually stationary and affixed to the heater walls (as micro-crevices, eg.), whereas for cavitation they are most often entrained with the liquid as

gas or vapor microbubbles. In many cases they may be hosted upon entrained solid microparticles. GRA

N75-22671# Michigan Univ., Ann Arbor. Dept. of Mechanical Engineering.
DISCUSSION OF SHOCK-EXCITED PULSATION OF LARGE AIR BUBBLES IN WATER
F. G. Hammitt Jan. 1975 4 p refs
(Grant NSF-40130)
(PB-239298/3; UMICH-012449-8-I) Avail: NTIS HC $3.25 CSCL 20D

The interaction of a pressure shock wave passing through a liquid with entrained gas or vapor bubbles is studied from the viewpoint of the absorption of the shock wave energy by the bubbles, and the consequent attentuation. It is also of interest from the standpoint of basic cavitation bubble dynamics and improved understanding of the concomitant damage phenomenon. GRA

N75-22672# McDonnell-Douglas Corp., Long Beach, Calif.
ON THE PROBLEM OF SHAPING AN AXISYMMETRIC BODY TO OBTAIN LOW DRAG AT LARGE REYNOLDS NUMBERS Final Technical Report, Jun. 1973 - Jan. 1975
J. L. Hess and R. M. James Jan. 1975 124 p refs
(Contract N00014-73-C-0502; NR Proj. 061-219)
(AD-A006588; MDC-J6791) Avail: NTIS CSCL 20/4

This report describes efforts in the analytic design of an axisymmetric body having low drag with a fully turbulent boundary layer in compressible flow. Drag is to be made small by proper shaping of the body. Several theoretical studies of various types are reported in the attempt to determine what body shapes have low drag. The principal conclusion is that the drag coefficient is not very sensitive to body shape. GRA

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources*. For related information see also *06 Aircraft Instrumentation*, and *19 Spacecraft Instrumentation*.

N75-22673 Michigan State Univ., East Lansing.
A STUDY OF PRECISION IN SPECTROPHOTOMETRIC TECHNIUQES Ph.D. Thesis
Leslie David Rothman 1974 151 p
Avail: Univ. Microfilms Order No. 75-7243

An instrument for photometric titrations is described which determines the sample concentration by a curve fitting technique. A minicomputer controls the instrument and fits the theoretically predicted titration curve to that observed experimentally. Titrations performed with this instrument were typically precise to + or - 0.3-0.1%. A device is described which prepares reagent solutions automatically under computer control. It is hoped that this device may be applied to fundamental chemical investigation requiring large numbers of accurately and precisely prepared solutions. It is projected that the present device will be able to prepare reagent solutions from a single stock solution over a concentration range ration of 3.6 x 10,000 with all concentrations precise to within 0.1%. Dissert. Abstr.

N75-22674 Stanford Univ., Calif.
DESIGN OF STATE-FEEDBACK CONTROLLERS INCLUDING SENSITIVITY REDUCTION, WITH APPLICATIONS TO PRECISION POINTING Ph.D. Thesis
Zeev Hadass 1974 267 p
Avail: Univ. Microfilms Order No. 75-6857

The design procedure of feedback controllers is described and the considerations for the selection of the design parameters are given. The frequency domain properties of single-input single-output systems using state feedback controllers are analyzed and desirable phase and gain margin properties are demonstrated. Special consideration is given to the design of controllers for tracking systems, especially those that are designed to track polynomial commands. A controller is designed for a tracking telescope with a polynomial tracking requirement. The problem of parameter sensitivity reduction is treated by considering the variable parameters as random variables. A performance index is defined as a weighted sum of the state and control convariances that stem from both random system disturbances and the parameter uncertainties. This performance index is minimized numerically by adjusting a set of free parameters. A computer program implementing this method is developed and is applied to the sensitivity reduction of several initially sensitive tracking systems. Sensitivity reduction factors of 2-3 are typically obtained with modest increses in output rms and control effort. Dissert. Abstr.

N75-22675 Stanford Univ., Calif.
ERROR MODELING OF PRECISION ORIENTATION SENSORS IN A FIXED BASE SIMULATION Ph.D. Thesis
David Lewis Klinger 1974 212 p
Avail: Univ. Microfilms Order No. 75-6874

A fixed base simulator was developed and used in developing methods of instrument error modeling and performance evaluation applicable to relativity experiment sensors and other precision pointing instruments. Atlas missile gyros, integrated into a Minuteman 1 guidance assembly, and two specially designed autocollimators were used as analogs to the relativity experiment sensors. A spectral approach was used in analyzing the fixed base simulator signals and developing error models for the sensors. Comparisons are made of gyro and automocollimator spectra taken with the instruments resting on quiet test beds and serving as feedback sensors in platform stabilization loops. Coherency between signals was used to indicate mutual instrument error sources and to provide confidence in the estimation of system transfer functions. Analysis of autocollimator spectra uncovered the presence of a platform gimbal resonance. The source of the resonance was isolated to gimbal bearing elastic restraint properties most apparent at small levels of motion. A model of these properties which include elastic and coulomb friction characteristics is discussed, and a describing function developed. Dissert. Abstr.

N75-22676 Michigan State Univ., East Lansing.
A COMPUTER-INTERACTIVE BIPOLAR PULSE CONDUCTANCE SYSTEM Ph.D. Thesis
Keith Joseph Caserta 1974 347 p
Avail: Univ. Microfilms Order No. 75-7137

A computer-interactive conductance measurement system is developed which utilizes the bipolar voltage pulse technique for conductance determination. The entire measurement system is controlled by a minicomputer. The system is composed of programs which enable it to acquire and analyze data for conductometric titrations, stopped flow kinetic experiments, dissociation constant determinations, absolute conductance measurements, chromatography monitoring, instrumental performance characterization, and instrumental self-testing. A computer-interactive instructional package is described for teaching operation of the system. Aqueous and nonaqueous titrations are investigated along with the chemiluminescence reaction of luminol with base in DMSO and 1:1 DMSO-EtOH. The system is shown to be a versatile and powerful measurement tool capable of monitoring conductance changes. Dissert. Abstr.

N75-22677 Stanford Univ., Calif.
VACUUM ULTRAVIOLET HOLOGRAPHY Ph.D. Thesis
Gary Carl Bjorklund 1974 164 p
Avail: Univ. Microfilms Order No. 75-6809

A method for vacuum ultraviolet (VUV) holography, based upon the use of a grainless photosensitive recording medium in conjunction with an electron microscope, was demonstrated by the production of a vacuum ultraviolet hologram. Simple holographic recording geometries which do not require diffraction limited VUV optical components were used. Experimental results, including the production of a holographic grating with an 838 A fringe spacing and the production of far-field Fraunhofer holograms of 1.305 microns diameter latex spheres, are presented. A theoretical analysis of third-order nonlinear interaction of focused laser beams is performed for the process w sub 1 + w sub 2 + w sub 3 approaches the limit of w sub 4, w sub 1 +

w sub 2 - w sub 3 approaches the limit of w sub 4, and w sub 1 - w sub 2 - w sub 3 approaches the limit of w sub 4. Dissert. Abstr.

N75-22678 Rensselaer Polytechnic Inst., Troy, N.Y.
A LIQUID CRYSTAL FIBER OPTIC TEMPERATURE SENSOR Ph.D. Thesis
Craig Wilby Smith 1974 134 p
Avail: Univ. Microfilms Order No. 75-5391

A temperature sensing device based on the optical activity of cholesteric liquid crystal films is described. Highly temperature dependent optical activity near the isotropic phase transition temperature is exhibited by dilute mixtures of cholesteric liquid crystal solutes in nematic liquid crystal solvents. Evaporation orientation techniques are used to obtain single domain films from these mixtures and sandwich them between crossed polarizers. Temperature changes are sensed by monitoring the monochromatic light transmission through the sandwich. Using a laser as a source, a device is installed at the end of a 3mm diameter fiber bundle and temperature changes are sensed with a sensitivity comparable to a thermistor. A theory is presented which explains the temperature dependence of cholesteric pitch in the vicinity of an isotropic phase transition. The theory conforms to the temperature dependent optical rotation data.
Dissert. Abstr.

N75-22679 Arizona State Univ., Tempe.
TWO SENSITIVE DETECTORS FOR LIQUID CHROMATOGRAPHY, THE AEROSOL DETECTOR AND THE SPRAY IMPACT DETECTOR Ph.D. Thesis
Richard Allen Mowery, Jr. 1974 208 p
Avail: Univ. Microfilms Order No. 75-6335

Two new detectors are introduced for monitoring reverse-phase, high performance liquid chromatography. Their operating principle is based on producing a charged aerosol from the liquid mobile phase by violent rupturing of the liquid surface. The first detector is called the flame aerosol detector. It consists of a turbulent burner that aspirates the mobile phase into a spray; and a screen with a potential that filters any air charge, but allows the evaporating droplets to pass into a partially evacuated chamber. The second detector is called the spray impact detector. A standing baseline current is generated by impact of the mobile phase under gas pressure onto a target electrode, which in turn is connected to an electrometer for voltage or current readout.
Dissert. Abstr.

N75-22680 Stanford Univ., Calif.
OPTICALLY SCANNED ACOUSTIC IMAGING Ph.D. Thesis
Charles Grady Roberts 1974 183 p
Avail: Univ. Microfilms Order No. 75-6913

A system is developed which forms visual images of high resolution acoustic patterns. A scanned optical spot is used to locally switch a large monolithic piezoelectric transducer and sequentially sample the acoustic pattern. The positive switching concept is domonstrated by the developed device. The relationship of the photoconductor parameters to switching and conversion efficiency are derived, and design criteria are defined. Considerations necessary for optimum transducer performance are investigated and trade-offs established. Techniques and requirements for fabrication, mounting, and electrical matching are described. Factors which affect image quality, such as phase sensitivity and nonuniformities in the photoconductor are discussed along with methods of controlling their effects. A theoretical analysis and explanation of the small signal phase and amplitude sensitivity characteristics of the system and of other coherent acoustic imaging systems is presented. Dissert. Abstr.

N75-22681 Princeton Univ., N.J.
AN ATTEMPT TO IMAGE AND PHOTOGRAPH AN ARRAY OF QUANTIZED VORTEX LINES IN ROTATING SUPERFLUID HELIUM Ph.D. Thesis
Julian D. Maynard, Jr. 1974 79 p
Avail: Univ. Microfilms Order No. 75-6701

The design of and experiments with a device to image and photograph the array are described. Some theoretical background of vortices in helium is given, and a few previously attempted methods of imaging the array are discussed. The method used in this experiment involves the trapping of negative ions produced by an alpha source onto the vortex lines, resulting in an array of current filaments in the liquid helium. These current filaments terminate on a wire array (a close-packed bundle of fine, insulated copper wires) which acts like fiber optics faceplate. On the opposite side of the wire array, the negative ions are ejected by ultraviolet light into a high vacuum region, where they are accelerated and focused by electric and magnetic fields onto a phosphor screen. The image on the phosphor screen is transmitted by a coherent fiber optics light pipe to an image intensifier and camera system. Dissert. Abstr.

N75-22682 California Univ., San Diego.
SOME TOPICS IN HOLOGRAPHIC IMAGE FORMATION Ph.D. Thesis
Charles Yau-Chi Liu 1974 221 p
Avail: Univ. Microfilms Order No. 75-9486

The subject matter is divided into three major portions that can be called real-time holographic image formation, quasi-holographic image formation through the turbulent atmosphere, and holographic spatial filtering for differentiation. The aim of the first portion is to provide a method that allows formation of holographic images in real time, i.e., without any delay due to the hologram recording process. The aim of the second portion is to improve Labeyrie's method for astronomical observations through the turbulent atmosphere. The aim of the third portion is to produce in a very simple manner some spatial filters which can perform the mathematical operation of differentiation upon the object. Dissert. Abstr.

N75-22683 Yale Univ., New Haven, Conn.
THE MEASUREMENT OF IMAGE TEXTURE PARAMETERS BY OPTICAL DIFFRACTION AND THEIR APPLICATION TO IMAGE PROCESSING Ph.D. Thesis
Enrique Garcia 1974 218 p
Avail: Univ. Microfilms Order No. 75-11266

A procedure for measuring the point-to-point local variance of a spatial random scene is described. The relations between the random second-order statistics and the optical parameters needed to furnish accurate variance estimates are established. The procedure is experimentally verified and modified using a diffuser to statistically homogenize an irradiance field. Spatial masks useful in image processing are synthesized and used as binary gates to isolate certain classes of objects within a scene and to reject all others. The action of the diffuser is analytically described and general results are developed for the statistical properties of the field scattered. The possibility of reconstructing an enhanced space autocorrelation function for the scene is shown. The enhanced space autocorrelation function highlights the non-differentiable regions of the ordinary space autocorrelation function. Dissert. Abstr.

N75-22684*# Beckman Instruments, Inc., Anaheim, Calif.
PRELIMINARY FLIGHT PROTOTYPE SILVER ION MONITORING SYSTEM, ADDENDUM Final Report
Ray I. Wilson Mar. 1975 46 p
(Contract NAS9-13387)
(NASA-CR-141785; FR-2687-101A) Avail: NTIS HC $3.75 CSCL 14B

A number of electrode fabrication techniques are investigated, to achieve an electrode meeting shuttle mission requirements for functional life and stability as well as accuracy and precision of measurement. The instability of a silver bromide column when employed in a closed loop calibration scheme is discussed.
M.C.F.

N75-22685*# Lockheed Electronics Co., Houston, Tex. Aerospace Systems Div.
TEST PROCEDURE FOR HASSELBLAD FIELD IRRADIANCE
Connie George Apr. 1975 20 p
(Contract NAS9-12200)
(NASA-CR-141776; LEC-5968; JSC-09629) Avail: NTIS HC $3.25 CSCL 14E

The procedure is defined for determining the uniformity of film plane illumination (field irradiance) of the Hasselblad cameras. The data source shall consist of photographs, with X-Y scans being taken for indication only. The accuracy requirement is 2.0%. Author

N75-22686# National Aerospace Lab., Tokyo (Japan).
STUDY OF A LOW-INERTIA HYSTERESIS MOTOR
Hiroshi Yamada 1975 9 p refs In JAPANESE; ENGLISH summary
(NAL-TR-405) Avail: NTIS HC $3.25

A rotary-drive vibratory-output two-degrees-of-freedom gyro was utilized in a rotor structure of an axial air gap hysteresis motor containing anisotropic barium ferrite and Al-alloy plates. The barium ferrite was used for its large hysteresis loop, small loss caused by harmonic waves based on the slots, and small specific gravity. The proposed motor has as a small inertia as a print motor, a large starting torque, and a large synchronous torque as compared with conventional hysteresis motors. The structure, the induction of the equivalent circuit containing hysteresis and induction torques, and the experimental characteristics of the motor are discussed. Author

N75-22687*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
METHOD AND APPARATUS FOR MEASURING WEB MATERIAL WOUND ON A REEL Patent Application
Ronald M. Muller, inventor (to NASA) Filed 4 Apr. 1975 22 p
(NASA-Case-GSC-11902-1; US-Patent-Appl-SN-565289) Avail: NTIS HC $3.25 CSCL 14B

Method and apparatus for measuring the number of layers of a web material of known thickness wound on a storage or take-up reel were developed based on the principle that, at a relatively large radius, the loci of layers of a thin web wound on the reel approximate a family of concentric circles having radii respectively successively increasing by a length equal to the web thickness, t. The difference in circumferences between adjacent web layers is substantially constant and equal to 2 Pi t. Tachometer pulses are generated in response to linear movement of the web and reset pulses are generated in response to rotation of the reel. A digital circuit, responsive to the tachometer and reset pulses, generates data indicative of the layer number of any layer of the web and of position of the web within the layer without requiring numerical interpolation. NASA

N75-22688*# National Aeronautics and Space Administration. Pasadena Office, Calif.
HIGH RESOLUTION FOURIER INTERFEROMETER-SPECTROPHOTOPOLARIMETER Patent Application
Alain L. Fymat, inventor (to NASA) (JPL) Filed 5 May 1975 32 p
(NAS7-100)
(NASA-Case-NPO-13604-1; US-Patent-Appl-SN-574219) Avail: NTIS HC $3.75 CSCL 14B

A Fourier spectropolarimeter was designed for use in a laboratory in determining high-resolution spectra of the four Stokes' parameters, providing the intensity and complete state of polarization of light reflected from, and transmitted through a scattering sample in a cell. A single linear polarizer-analyzer of variable orientation, and specially arranged mirrors is used. The mirrors are employed to switch between modes using three mirrors in each mode. Mirrors are paired for compensated (zero net) polarizing effect between them, and the third one introduces the same uncompensated polarizing effect in all three modes. The polarization interferograms can be recorded with the spectral resolution provided by the interferometer. NASA

N75-22689*# National Aeronautics and Space Administration. Pasadena Office, Calif.
MYOCARDIUM WALL THICKNESS TRANSDUCER Patent Application
Cyril Feldstein, inventors (to NASA) (JPL), Gilbert W. Lewis (JPL), Robert H. Silver (JPL), and Virgil H. Culler (JPL) Filed 5 May 1975 15 p
(Contract NAS7-100)
(NASA-Case-NPO-13644-1; US-Patent-Appl-SN-574218) Avail: NTIS HC $3.25 CSCL 06B

The design of an improved transducer for measuring myocardium wall thickness changes is discussed. A sensitive strain gauge is bonded to the beam to sense changes in the tension. The working end of the spike is inserted through the epicardium into the myocardium. As the heart contracts, larger beam-deforming forces are applied to the beam. Increased beam tension is sensed by the strain gauge and recorded. NASA

N75-22690*# Technicolor Graphic Services, Inc., Houston, Tex.
BLACK-AND-WHITE SEPARATIONS OF SPACECRAFT ORIGINAL FILM
Lincoln Perry Mar. 1975 30 p refs
(Contract NAS9-11500)
(NASA-CR-141777; JSC-09622) Avail: NTIS HC $3.75 CSCL 14E

Separation systems and a detailed procedure for the production and evaluation of separation negatives are reported. It is shown that these separation negatives have excellent stability, and meet archival storage requirements. M.C.F.

N75-22691*# Scientific Translation Service, Santa Barbara, Calif.
METHOD AND APPARATUS FOR THE ELECTRIC MEASUREMENT OF PHYSICAL VALUE, FOR EXAMPLE, MEASUREMENT OF MECHANICAL STRESSES
James Garrett Yates May 1975 27 p Transl. into ENGLISH from German Patent no. 837476, 19 May 1949 15 p
(Contract NASw-2483)
(NASA-TT-F-16318) Avail: NTIS HC $3.75 CSCL 14C

Resistance and reactance measuring devises are described with application to the following: Thermometer, bolometer, force transducer, moisture, magnetic field frequency, light intensity, stress. Several measuring bridges are presented, which incorporate compensating, amplifying and conditioning circuits. Applications include stress measurements in propellors of flying aircraft from ground stations. Stress shock pulses can be measured with the devices as well as high frequency stress pulses. Author

N75-22692# Sandia Labs., Albuquerque, N.Mex.
EVIDENCE OF OUTGASSED WATER VAPOR AS DETECTED BY AN ON-BOARD MASS SPECTROMETER
R. O. Woods 1974 10 p refs Presented at Conf. on the Am. Geophysical Union, San Francisco, 12 Dec. 1974
(SAND-74-5863; Conf-741203-2) Avail: NTIS HC $3.25

A cryogenically pumped positive-ion and neutral-species quadrupole mass spectrometer was flown as part of the instrument payload in a balloon-borne experiment at 28 kilometers altitude. The relevance of the outgassing problem and the relationship of the measured water vapor density to the results of other experiments in the payload are discussed. Author (NSA)

N75-22693# Los Alamos Scientific Lab., N.Mex.
PORTABLE FLASH X-RAY SYSTEMS: TECHNIQUES AND APPLICATIONS
L. E. Bryant, Jr. Sep. 1974 16 p refs
(Contract W-7405-eng-36)
(LA-5756-MS) Avail: NTIS HC $3.25

Advantages, limitations, applications, and techniques are given for 180-kV, 600-kV, and 2.0-MeV portable flash X-ray systems. Suggestions are made for protection of equipment and film, for accurate pulse triggering, and for obtaining high quality images under the constraints of blast and shrapnel from explosions. There are flash radiographs illustrating bullet and projectile trajectories, jet phenomena, demolition device and fragmentation device studies, and shock waves in solids. Author (NSA)

N75-22694# Los Alamos Scientific Lab., N.Mex.
ELECTRONIC IDENTIFICATION AND TEMPERATURE MONITORING Annual Report, 1 Jul. 1973 - 30 Jun. 1974
A. Koelle, R. Freyman, S. Depp, and D. Holm Dec. 1974 6 p refs
(Contract W-7405-eng-36)
(LA-5790-PR) Avail: NTIS HC $3.25

During fiscal year 1975 the proof of principle of electronic identification and temperature monitoring of animals was established. A preprototype system including two transponders and battery powered readout was constructed and demonstrated to be capable of transmitting three decimal digits of identification and temperature to 1/10 degree Celsius accuracy to a range of about 7 m. Plans are being made to improve the circuitry and to design a national electronic identification and temperature monitoring system with the Unites Stated Department of Agriculture (USDA). The system appears to have other applications

for identifying and monitoring highly valued items.
Author (NSA)

N75-22695# Los Alamos Scientific Lab., N.Mex.
HIGH-SPEED OPTICAL ANALYSIS OF MICROSCOPIC PARTICLES
J. M. Crowell, G. C. Salzman, P. F. Mullaney, and J. C. Martin 1974 16 p refs Presented at Electro Optics Systems Design Conf.; San Francisco, 5 Nov. 1974
(Contract W-7405-eng-36)
(LA-UR-74-1687; Conf-741111-2) Avail: NTIS HC $3.25

Information about size and internal structure of biological cells and other microscopic particles were obtained from their optical properties. Plastic microspheres and human cells were passed singly through a flow chamber developed at LASL, scattered light was detected at thirty-two different angles, and multiparameter data were obtained using a photodiode array. Microspheres were classified according to size using a two-parameter pulse-height analyzer. With the incorporation of a second detector at 90 deg, the principal types of unstained and unfixed human white blood cells based on their light-scattering characteristics were classified. Author (NSA)

N75-22696# Brookhaven National Lab., Upton, N.Y.
LOW P. F. WATTMETER, IH-744: INSTRUCTIONS FOR USE
R. L Chase [1974] 7 p Sponsored by ERDA
(BNL-19404) Avail: NTIS HC $3.25

The wattmeter consists of a four quadrant multiplier, a selectable gain voltage amplifier, and an amplifier-integrator combination for converting an inductive pickup signal to a signal proportional to current. It is intended for measuring power (the average value of the instantaneous product of V and I) under conditions where the V and I signals are almost 90 deg out of phase. Under these circumstances, slight relative phase shifts in the two signals and small zero errors in wattmeter can cause serious errors. A systematic adjustment procedure for minimizing these errors is described. Author (NSA)

N75-22697# Atlantic Richfield Hanford Co., Richland, Wash.
CAMAC SERIAL HIGHWAY UTILIZING A LASER LINK
C. C. Scaief, III and G. L. Troyer 1974 4 p refs Presented at the Nucl. Sci. Symp., Washington, D. C., 11 Dec. 1974
(Contract AT(45-1)-2130)
(ARH-SA-199; Conf-741213-4) Avail: NTIS HC $3.25

A system for extending a CAMAC serial highway to a distance of 2 kilometers using an optical link is described. The system utilizes commercially available laser transceivers operating in the pulse mode. Information is transmitted asynchronously and then resynchronized at the receiver interface. The serial highway extension provides effective remote instrument control and interprocessor communication for routine laboratory analyses and process support. Author (NSA)

N75-22698# Comitato Nazionale per l'Energia Nucleare, Rome (Italy).
REPEATABILITY OF VARIOUS TYPES OF THERMOCOUPLES EXPOSED TO THERMAL CYCLING
P. Lupoli and L. Pandolfi Sep. 1974 44 p refs In ITALIAN
(RT/ING-(74)31) Avail: ERDA Depository Libraries HC $5.25

Thermoelectric stability of some thermocouples in the range 400 to 1000 C, after exposure to air at 1000 C for periods of time up to 1000 h, was studied. Couples prepared from Pt/0.1 percent Mo-Pt/5 percent Mo; Platinel 2, Pt-Pt/10 percent Rh; Au-Pd: Ag-Pd; chromel-alumel bare wires; and Pt-Pt/10 percent Rh; chromel-alumel sheated couples were considered. In the first case, the thermal emf variation is generally not high and sometimes does not exceed the calibration error. Tables giving emfs for each degree Celsius were computed for some of them. In the other case, the errors increase with time and may amount to 100 C or more, as for Pt-Pt/10 percent Rh, MgO insulated inconel sheated thermocouples. Author (NSA)

N75-22699# Oesterreichische Studiengesellschaft fuer Atomenergie G.m.b.H., Seibersdorf.
VERSATILE LIQUID HELIUM COOLING STAGE FOR THE TRANSMISSION ELECTRON MICROSCOPE
E. M. Hoerl Sep. 1974 8 p Presented at 8th Intern. Conf. on Electron Microscopy, Canberra, Australia, 25 Aug. 1974
(SGAE-2350; Conf-740853-1; ME-62/74) Avail: ERDA Depository Libraries HC $4.00

A versatile liquid helium cooling stage for the transmission electron microscope was constructed. It can be used in the temperature range between 4.2 and approximately 2 K for a great variety of in situ experiments, for instance for studies of solidified permanent gases, irradiation experiments applying nuclear particles or investigations for which a horizontal magnetic field is necessary. NSA

N75-22700# Argonne National Lab., Ill.
BASIC LIMITATIONS OF SCINTILLATION COUNTERS IN TIME MEASUREMENTS
F. J. Lynch 1974 12 p refs Presented at the 1974 Nucl. Sci. Symp. and the 14th Scintillation and Semicond. Symp., Washington, D. C., 11-13 Dec. 1974 Sponsored by ERDA
(Conf-741212-7) Avail: NTIS HC $3.25

The time resolution of a scintillation detector is calculated from the scintillator illumination function, and the response of the photomultiplier to an instantaneous pulse of light. Such calculations using the parameters of present scintillators and photomultipliers agree with measured resolutions and predict improvements. Parameters of commercial and some promising experimental fast scintillators are given, as well as measurements on transit time spread of some fast photomultipliers.
Author (NSA)

N75-22701# Los Alamos Scientific Lab., N.Mex.
FABRICATION AND X-RAY CALIBRATION OF THIN PLASTIC SCINTILLATORS
P. B. Lyons 1974 6 p refs Presented at the 14th Scintillation and Semiconductor Symp., Washington, D. C., 1 Dec. 1974
(Contract W-7405-eng-36)
(LA-UR-74-1888; Conf-741212-6) Avail: NTIS HC $3.25

Thin film plastic scintillator detectors were fabricated and calibrated with X rays in the 1.5 to 20 keV range. The calibration systems used are described. Measurements showed that the presence of a film substrate can significantly change the detector response. X ray conversion efficiency was determined as a function of energy and shown to be a strong function of energy for low energy X rays. Author (NSA)

N75-22702# California Univ., Livermore. Lawrence Livermore Lab.
HIGH VOLTAGE PHOTOGRAPHY APPLIED TO MATERIALS SCIENCE
D. E. Lord and R. R. Petrini 25 Nov. 1974 12 p refs
(Contract W-7405-eng-48)
(UCRL-51702) Avail: NTIS HC $3.25

Application of high voltage photography to a variety of materials science uses, particularly residual strain measurement, is described. The technique appears to magnify an object's surface/subsurface condition that is an indicator of its internal strain state. High voltage photography appears sensitive to impurities and porosities. Materials testing and nondestructive testing applications appear numerous. Author (NSA)

N75-22703# Commissariat a l'Energie Atomique, Saclay (France).
TESTS OF DIFFERENT COINCIDENCE SYSTEMS WITH LARGE VOLUME Ge-Li DETECTORS
D. Bek-Uzarov and C. Clement Nov. 1974 23 p refs In FRENCH
(CEA-R-4449) Avail: ERDA Depository Libraries HC $4.25

To achieve coincidence measurements in a large energy range the following systems were checked: a simple discriminator, a two threshold discriminator, a constant amplitude fraction discriminator, and a duration discriminator. Three Ge-Li detectors were used (35 to 50 cc). A plastic scintillator with a fast photomultiplier gave a time reference. The characteristics of the coincidence systems were established for different situations.
Author (NSA)

N75-22704# Royal Armament Research and Development Establishment, Fort Halstead (England).
A FURTHER INVESTIGATION INTO THE EFFECTS OF SCATTERED RADIATION UPON IMAGE SHARPNESS AND CONTRAST, USING COBALT-60 GAMMA RADIATION AND

STEEL PLATES IN THE THICKNESS RANGE 3 TO 100mm
M. Dowd and R. Halmshaw Nov. 1974 21 p refs
(RARDE-Memo-161/74; BR44026) Avail: NTIS HC $3.25

The effects of scattered radiation upon image sharpness using cobalted gamma radiation and steel plates as the scattering media, and a thin steel step-wedge varying in thickness from 1 to 10 mm in 1 mm steps are determined. The film plane was sited much nearer the fixed step-wedge than in a previous study, in two separate series of exposures using wedge-film distances of 40 mm and 9 mm. It is shown that there is no effect on the image sharpness at small steps due to the scattered radiation. ESRO

N75-22705# Watervliet Arsenal, N.Y.
A NOVEL METHOD OF MEASURING TEMPERATURES DUE TO SLIDING IN ULTRA-HIGH VACUUM
John D. Vasilakis and Frederick F. Ling (Rensselaer Polytech. Inst., Troy, N. Y.) Paris ESRO 1975 40 p refs Presented at the European Space Tribology Symp., Frascati, Italy, 9-11 Apr. 1975
(Contracts AF-33(657)-10058; AF-33(615)-3378)
Avail: NTIS HC $3.75

An apparatus was designed and built for the measurement of temperatures due to friction near the interface of two sliding objects. The sliding specimen is electromagnetically suspended and rotated in the suspended position. The only elements in contact with the slider are the rider specimens which act not only as friction sources but also as bearings, guiding the rotating slider. Temperature probes in the slider are temperature sensitive resistors in a transmitter circuit. As their temperature changes, so does the frequency of transmission. In this way, temperatures are transmitted outside the system without introducing any additional contacts. Temperatures on the rider are measured with thermocouples. The normal force on the slider due to the rider and the total torque in the system are also measured. Temperatures are measured both in air and in vacuum. A simplified configuration was chosen for each the slider and the rider. The theory is developed to enable the usage of the measured temperatures as boundary points and the radiation constant as a parameter in calculating the interface temperatures. Author ESRO

N75-22706# Stanford Univ., Calif. Electronics Labs.
THE SHADOW TRANSFORM: AN APPROACH TO CROSS SECTIONAL IMAGING
Moshe Ein-Gal Nov. 1974 75 p refs
(Kontract N00014-67-A-0112-0044)
(AD-A003018; SU-SEL-74-050) Avail: NTIS CSCL 09/4

The goal of this work is to define and investigate the properties of the linear operator that relates the density to its set of projections--the shadow. Several approaches to the definition of the shadow transform are presented in Chapter I. Chapter II provides the basis for the spectral analysis by deriving the eigenfunctions of the shadow transform. Chapter III deals with the derivation of reconstruction schemes (realizations of the inverse shadow transform). In Chapter IV the author develops the theory for the case where the measurement of the projections is limited by the geometry. GRA

N75-22707# General Electric Co., Syracuse, N.Y. Transducer Products Operation.
PERFORMANCE SPECIFICATION FOR DUMILOAD TRANSDUCER TESTER Final Report
Wayne A. Miller Aug. 1974 48 p
(Contract N00024-73-C-1063; SF 11121)
(AD-A007222) Avail: NTIS CSCL 17/1

A DUMILOAD (DUmmy Mechanical Impedance LOAD) testing device has been developed to allow the rapid testing of sonar transducer elements. Significant features of the device described in this performance specification are its high power operation, nondestructive connect/disconnect technique, and rapid operation. GRA

N75-22708# General Electric Co., Syracuse, N.Y. Transducer Products Operation.
OPERATOR'S MANUAL: DUMILOAD TRANSDUCER TESTER Final Report
Wayne A. Miller Aug. 1974 33 p
(Contract N00024-73-C-1063; SF 11121)
(AD-A007221) Avail: NTIS CSCL 17/1

A DUMILOAD (DUmmy Mechanical Impedance LOAD) testing device has been developed to allow the rapid testing of sonar transducer elements. The operator's manual is a description of the installation, operation, and maintenance of the device for high power testing transducers. GRA

N75-22709# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
HIGH-RESOLUTION FOURIER SPECTROSCOPY Instrumentation Papers
Hajime Sakai 14 Nov. 1974 24 p refs
(AF Proj. 8603)
(AD-A006688; AFCRL-IP-224; AFCRL-TR-75-0571) Avail: NTIS CSCL 07/4

This report describes the high-resolution Fourier spectroscopy measurement technique being used at AFCRL. It deals mainly with noise problems of measurement, the noise compensation scheme, and the interferogram signal-detection scheme. The spectral data presented to demonstrate performance of the instrument were obtained with a resolution of 0.0075/cm. GRA

N75-22710# Stanford Research Inst., Menlo Park, Calif.
STRESS GAGE SYSTEM FOR THE MEGABAR RANGE Final Report, 2 Apr. 1973 - 30 Jun. 1974
Paul S. DeCarli Jun. 1974 44 p refs
(Contract DNA001-73-C-0225; SRI Proj. PYU-2570)
(AD-A006980; DNA-3593F) Avail: NTIS CSCL 14/2

The report covers a one-year study of the feasibility of measuring stress wave profiles in the megabar range. The primary objective was accomplished with the successful manganin gage recording of a 1.2 megabar stress wave profile, including release to zero stress. The conductivities of various insulators were measured at shock stresses of 700-800 kbar. Lucalox (Al_2O_3 ceramic), fused silica, and a Cabal glass were excellent insulators in this stress range. The electrical resistivity of epoxy at high shock stresses was improved by adding Al_2O_3 powder. The mutual inductance particle velocity gage did not show promise of working at very high stresses in a nuclear test environment. Further developmental work is suggested. GRA

N75-22711# Texas Instruments, Inc., Dallas.
FAIL-SAFE OIL-IN-WATER MONITOR DEVELOPMENT Final Report, 20 Jun. 1973 - Dec. 1974
Harry L. Higginbotham 15 Feb. 1975 94 p
(Contract DAAK02-73-C-0387)
(AD-A007242) Avail: NTIS CSCL 14/2

This report first describes the study conducted to determine the best technique for detection of small quantities of oil-in-water. It then outlines the theoretical basis for the detection of oil using the methylene group absorption characteristics. The report then describes the experimental model sensor proposed to solve the detection problem and ends with a description and evaluation of the experimental model actually fabricated. Essential elements of this system are described in detail. Evaluation of the experimental model sensor showed that its capability was limited to detection of several parts per million. This was not due to the detection concept, but rather to the mechanical-electronic interface. The system is considerably more susceptible to low frequency variations in the light path than was expected. GRA

N75-22712# Air Force Academy, Colo. Frank J. Seiler Research Lab.
DEVELOPMENT OF A QUARTZ FIBER ANGULAR MOTION SENSOR Interim Report
Shigeo Okubo Jan. 1975 41 p
(Contract F05611-73-C-0269; AF Proj. 7904)
(AD-A006894; SRL-TR-75-0002) Avail: NTIS CSCL 14/2

Progress in the development of the quartz fiber angular motion sensor is described. Magnetic eddy current dampers were evolved which made it possible to operate as an angular rate sensor in the 0.1 to 7 rad/sec bandwidth with a midband frequency of 1 rad/sec. Improvements were made in the photoelectric pickoff and amplifier configuration. The sensor scale factor is 50 mv/deg/hr. Below 0.1 rad/sec, the sensor is an angular accelerometer with a sensitivity of 1 volt/rad/(sec squared).

Above 7 rad/sec it is an angular displacement sensor with a sensitivity of 1 volt/sec. Evaluation testing of the sensors is also presented. GRA

N75-22713# Aerospace Corp., El Segundo, Calif.
DYNAMIC CALIBRATION FOR DELCO'S CAROUSEL VB IMU Final Report
A. C. Liang and J. L. LeMay 23 Sep. 1974 8 p refs
(Contract F04701-74-C-0075)
(AD-A007056; TR-0075(5413-02)-1; SAMSO-TR-74-246) Avail: NTIS CSCL 17/7

The paper addresses the application of filtering theory to the problem of IMU dynamic calibration and, in particular, to the Carousel VB system. In the calibration procedure, accelerometer outputs are summed over long time intervals before processing. For this reason, the standard K-B filter needs to be modified as presented in the paper. Filter derivation and calibration results from processing real accelerometer data are presented herein. GRA

N75-22714# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
A PHOTOMETRIC METHOD FOR DETERMINING THE NUMBER AND SIZE OF DROPS OF ATOMIZED FUEL IN A FLOW
V. Ya. Basevich 6 Oct. 1975 13 p refs Transl. into ENGLISH from Pribory i Tekhn. Eksperim. (USSR), no. 6, Nov./Dec. 1957 p 89-91
(AD-A006696; FTD-HT-23-643-75) Avail: NTIS CSCL 14/2

A method of determining the number and size of fuel drops in a air flow is described. The method has been based on the reflection of light during the passage of a drop through a light beam and the recording of the light pulses with the aid of a photomultiplier and a cathode oscillograph or counting device. GRA

N75-22715# New Mexico Univ., Albuquerque. Eric H. Wang Civil Engineering Research Facility.
DEVELOPMENT AND EVALUATION OF ION-EXCHANGE SILVER RECOVERY PILOT PLANT Final Report, Sep. 1972 - Nov. 1973
Edward R. Moss and Archie G. Buyers Mar. 1975 66 p refs
(Contract F29601-72-C-0024; AF Proj. 683M)
(AD-A007048; AFWL-TR-74-14) Avail: NTIS CSCL 07/1

An ion-exchange silver recovery pilot plant was designed, constructed, and operated to determine the feasibility of using ion-exchange resins to recover silver from spent photographic fixer solutions. Results indicate that ion-exchange silver recovery is technically feasible since the silver concentration in the fix tank can be maintained below 0.05 gm Ag(+)/l with complete recycle of the fixer solution, the ion-exchange resin can be regenerated, and the silver can be recovered from the regenerant solution by electrolysis. Cost evaluation of the ion-exchange silver recovery system indicates that this method is not the most economical for recovering silver from fixer solutions; electrolytic recycling appears to be more economical. GRA

N75-22716# Air Force Avionics Lab., Wright-Patterson AFB, Ohio.
A HIGH DATA RATE DIGITAL SPATIAL FREQUENCY TRACKING SYSTEM
Harry M. Dobbins and Michael J. Noviskey Dec. 1974 30 p
(AF Proj. 2001)
(AD-A006692; AFAL-TR-74-293) Avail: NTIS CSCL 17/8

This study analyzes a non-imaging high data rate tracking system. The system optically sums the scene energy onto two perpendicular linear diode arrays. The current distribution on these diode arrays is Fourier transformed giving the amplitude and phase position of the individual spatial frequency components. On successive frames of data the difference in phase is shown to be proportional to the scene displacement. A statistical approach is used to calculate the displacement distance. Using spatial frequencies, subresolution element tracking accuracies are achieved. The equivalence of this system to a correlation tracker is shown and the effect of noise in the signal is analyzed. GRA

N75-22717# TRW, Inc., Philadelphia, Pa.
PRODUCTION ENGINEERING MEASURE FOR THIN FILM RATIOMETER Quarterly Progress Report, 1 Oct. - 31 Dec. 1974
Harry B. Casey 31 Dec. 1974 32 p refs
(Contract DAAB05-73-C-2077)
(AD-A007249; QPR-6) Avail: NTIS CSCL 14/2

The purpose of this production engineering measure is to develop an optimized production process for the manufacture of thin film ratiometers. This report describes the work completed during the sixth quarterly reporting period. GRA

N75-22718# Army Electronics Command, Fort Monmouth, N.J.
ALL-PURPOSE PROCESSING FORMULATION FOR COLOR NEGATIVE MATERIALS Final Report
Marilyn Levy and Harmon A. Willey Mar. 1975 23 p
(AD-A007109; ECOM-4299) CSCL 14/5

A two-solution color processing system has been formulated that is more rapid than black-and-white processing and eliminates the need for ferricyanide bleach, one of the most objectionable pollutants discarded from photographic processing facilities. This all-purpose chemistry can be used to process all of the following color photographic emulsions: Kodacolor-X, Ektacolor-S, Vericolor-S, Aerocolor Negative, Ektacolor Internegative, Ektacolor Print Films, Ektacolor RC Paper and several reversal films processed to a negative. The access time as well as the number of processing steps, is markedly reduced when the ECOM chemistry is used. Negatives and transparency prints are processed in 1/5 the time required with conventional processing and paper processing time is reduced by 1/2 without degrading the color or stability characteristics of the processed emulsion. GRA

N75-22719# Universal Propulsion Co., Santa Barbara, Calif. Metrophysics Div.
DEVELOPMENT AND PRODUCTION OF A FEASIBILITY TYPE ADVANCED DEVELOPMENT MODEL SOLID STATE TRANSMITTER FOR THE ATMOSPHERIC METEOROLOGICAL RADIOSONDE SET AW/AMT XE-VE Final Report
Charles R. Kenny, Anthony DelDuca, and Stafford R. Hall Mar. 1974 41 p refs
(Contract DAAB07-73-C-0126)
(AD-A006809; UPCO-W/A-7015-1; ECOM-0126-F-73) Avail: NTIS CSCL 04/2

The objective was to produce a low cost unit in large production lots designed to be stored in the battery compartment of the modulator cavity MD-210 and to achieve low power consumption. A power oscillator in a stripline circuit using a Teflon substrate was used and a high degree of stability was achieved at relatively low cost. The final design resulted in developing a single printed circuit board integrating stripline circuits of the voltage/regulator modulator and pulse generator along with the RF generator and antenna. The feasibility of an Advanced Solid State Transmitter in the 1660 MHz - 1700 MHz frequency range was demonstrated. All units subjected to environmental testing proved the viability of the design. GRA

N75-22720# Canada Centre for Remote Sensing, Ottawa (Ontario).
ERTS IMAGERY INTERPRETATION PACKAGE: SUGGESTIONS FOR LABORATORY DESIGN
T. T. Alfoldi and R. A. Ryerson Nov. 1973 24 p refs
(PB-238843/7; TN-73-4) Avail: NTIS HC $3.25 CSCL 14B

Information on equipment and furniture required to make the maximum use of ERTS (Earth Resources Technology Satellite) and related airborne data, in a non-digital image analysis laboratory is presented. Exclusive of building rent, services and salaries, the incremental cost would be in the order of $50,000. A second laboratory for a higher budget is also described. GRA

36 LASERS AND MASERS

Includes parametric amplifiers.

N75-22721 California Univ., Davis.
USE OF RELATIVISTIC ELECTRON BEAMS FOR THE STUDY OF CHEMICAL AND RARE GAS LASER SYSTEMS Ph.D. Thesis
Barton Krawetz 1974 76 p

Avail: Univ. Microfilms Order No. 75-8342

Chemical ($NF_3 + H_2$) and rare gas molecular (Ke_2,Kr_2,Ar_2) laser systems are examined. Intense relativistic electron beams are used as a source of initiation and stimulation respectively. For the high gain chemical system, nonlinear amplification and pulse propagation are examined. The experimental result shows all the qualitative features of the theoretical prediction. In addition certain kinetic excitation and deactivation mechanisms are studied through the short stimulation time available with the electron beam. Results obtained from the examination of laser action of the test system compare well with more conventional schemes for kinetic rate data extraction. For rare gas molecular systems, the electron beam provided an excellent tool for studying the energy flow beginning with formation of the diatomic eximer to final decay by spontaneous radiative decay. Laser action in Krypton (Kr_2) is predicted. Dissert. Abstr.

N75-22722 Polish Academy of Sciences, Warsaw.
CONVERSION OF ELECTRICAL ENERGY INTO LASER RADIATION ENERGY IN HIGH PRESSURE MIXTURES OF MOLECULAR GASES [KONWERSJA ENERGII ELEKTRYCZNEJ W ENERGIE PROMIENIOWANIA LASEROWEGO W WYSOKOCISNIENIOWEJ MIESZANINIE GAZOW MOLEKULARNYCH]
Wojciech W. Byszewski 1974 181 p refs In POLISH
Avail: Issuing Activity

The physical processes taking place in the plasma of a carbon dioxide laser and their influence on electrical energy conversion were investigated. Other topics discussed include kinetics of electron collisions, variations in energy transport coefficients during electron-molecule collisions, differential equations (which describe changes in molecular density, electron density, and radiation intensity), the dependence of energy characteristics on gas pressure and electron energy, and numerical modelling of electron beam controlled high pressure discharge.
Transl. by M.J.S.

N75-22723 California Inst. of Tech., Pasadena.
PART 1: THE CONSTRUCTION OF A MODE-LOCKED Nd(3PLUS): GLASS LASER AND NON-LINEAR OPTICAL TECHNIQUES. PART 2: APPLICATIONS OF PICOSECOND LASER PULSES IN CHEMISTRY: VIBRATIONAL RELAXATION TIMES IN LIQUID ALKANES AND ALKENES Ph.D. Thesis
Saon Patumtevapibal 1975 149 p
Avail: Univ. Microfilms Order No. 75-9534

The generation of a train of picosecond 1.06 micron pulses is achieved by properly aligning a saturable absorber in a Nd glass laser cavity. In order to make the laser more chemically useful, second harmonic generation of the fundamental pulses is necessary. A phase-matched KDP crystal is employed in this process. Some nonlinear optical techniques, such as stimulated Raman scattering and self-phased modulation, which generates continuum light from monochromatic pulses, also enrich the usage of the laser. Dephasing times and vibrational lifetimes of C-H stretching vibrations are studied systematically in a series results indicate that the vibrational energy loss takes place primarily through the methyl groups in these molecules. Dissert. Abstr.

N75-22724 Oklahoma State Univ., Stillwater.
A PRECISION MEASUREMENT OF FRESNEL DRAG IN A RING LASER Ph.D. Thesis
Walter Kent Stowell 1974 102 p
Avail: Univ. Microfilms Order No. 75-8899

Seventeen curves were plotted using the experimentally obtained data. The slopes of these curves were then used to determine the drag coefficient the sagnac effect due to the earth's rotation is well represented in the data such that the experimental value is within 10% of the theoretical value. On consideration of the existing theoretical models that: (1) the Fresnel drag coefficient (without dispersion) is unquestionably rejected, (2) the Laub formulation gives a value which differs from by more than 12 times the standard deviation of the experimental data. Based on this and the conditions of these experiments the Laub drag coefficient is thus rejected. Based on these experimental results, it appears that none of the existing theoretical models account for the actual drag in a ring laser. The contributions to the experimental error are analyzed, and suggestions are made for their reduction, and for measurements to be performed in the infrared frequency range and using liquids. Dissert. Abstr.

N75-22725 California Univ., San Diego.
A 700 METER LONG VACUUM CAVITY ARGON ION LASER: ITS MODE INTERACTIONS AND MODE LOCKED OPERATION Ph.D. Thesis
Prabhakar Pati Tripathi 1974 341 p
Avail: Univ. Microfilms Order No. 75-9490

A visible laser, Argon Ion on the high gain 4880 A transition, was made to operate in a long optical cavity. Design criteria for a system consisting of a long evacuated pipe with windows on the ends and a laser discharge tube are considered. Refractive optics are used for beam expansion and retroreflection. Intermode beats were observed and are explained with the hypothesis of energy being pumped into these cavity modes because of the nonlinear coupling through the laser plasma, as the discharge current fluctuated with its inherent 60 Hz ripple. The intermode beats vanished and true single frequency operation was obtained on switching to dc supply for heating the laser cathode filament. Intra-cavity loss modulation was achieved by applying a drive at a proper frequency to the Pockels' cell modulator which in conjunction with the Brewster window of the laser tube introduced a varying loss. Optical pulses were detected by a photodetector, amplified and properly delayed and fed back to the drive circuit of the modulator. Self-regeneratively driven mode-locked-pulse operation was achieved by closing the feedback loop and removing the original driven oscillator. Dissert. Abstr.

N75-22726 Alabama Univ., University.
STUDY OF THE GAIN-DEPENDENT REFRACTIVE INDEX OF A CO2 LASER Ph.D. Thesis
Thomas Edison Honeycutt 1974 149 p
Avail: Univ. Microfilms Order No. 75-9908

Experimentaliy discovered frequency-jumping and gain-discontinuity effects in a three-mirror laser were studied using a newly-developed mathematical model which assumed the presence of a gain-dependent portion of the refractive index of the laser medium. The analytical results are related to the experimental results obtained from a long, three-mirror, frequency-modulated CO_2 laser cavity. It was found that the simple model predicts, qualitatively, the experimental results. Frequency pushing is the dominant mode interaction process in a reflective-type, coupled-cavity laser. This process is more dependent upon the direction in which the laser frequency is swept than it is upon the location of the pertinent mode frequencies relative to the linecenter frequency. Dissert. Abstr.

N75-22727# Materials Research Labs., Maribyrnong (Australia).
THE EFFECT OF AEROSOLS AND TURBULENCE ON THE TRANSMISSION OF HIGH-POWER LASER BEAMS
B. C. H. Wendlandt Feb. 1975 20 p refs
(Rept-621) Avail: NTIS HC $3.25

The effect of aerosols and turbulence on the transmission of high-power laser beams is examined over the wavelength range of 0.3 micron to 10.6 micron. The influence of beam shaping and ionization are also considered. The work is largely based on the literature published before mid 1974. Author

N75-22728# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
PRINCIPLES AND APPLICATIONS OF THE LASER VELOCIMETER [LE VELOCIMETRE LASER - PRINCIPES ET APPLICATIONS]
Oct. 1974 54 p refs In FRENCH Presented at the IBRA Seminar on "Le Laser comme Capteur dans les Chaines de Reglage-Realisations et Perspectives," Liege, May 1974 Submitted for publication
(VKI-TM-25) Avail: NTIS HC $4.25

The principles of the laser Doppler velocimeter are summarized, distinguishing two main types: reference beam, and crossed beam or interference mode. Applications to fluid flow velocity measurements are described for gas-solid particle suspension, stream turbines, and pumps. The associated electronic equipment for Doppler frequency analysis is detailed. These systems can consist of a frequency analyzer, a frequency tracker demodulator, or a frequency counter. For individual titles, see N75-22729 through N75-22730.

N75-22729 Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
APPLICATION OF LASERS TO VELOCITY MEASUREMENTS IN FLUIDS [APPLICATION DU LASER AUX MESURES DE VITESSE DANS LES FLUIDES]
M. Riethmuller *In its* Principles and Appl. of the Laser Velocimeter Oct. 1974 p 1-25 refs In FRENCH (For availability see N75-22728 14-36)

The laser velocimeter is considered an instrument for rapid flow measurements which, up to now, were difficult or impossible to obtain. Advantages include a large velocity range, precision, no calibration necessary, and the complete absence of perturbations. The principles of the laser Doppler velocimeter are summarized, distinguishing two main types: reference beam, and crossed beam or interference mode. Applications to flow velocity measurements are described for gas-solid particle suspensions, steam turbines, and pumps. ESRO

N75-22730 Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
ELECTRONIC SYSTEMS APPLIED TO LASER ANEMOMETERS [SYSTEMES ELECTRONIQUES APPLIQUES AUX ANEMOMETRES A LASER]
D. Olivari *In its* Principles and Appl. of the Laser Velocimeter Oct. 1975 p 27-51 refs In FRENCH (For availability see N75-22728 14-36)

Electronic equipment for the analysis of laser Doppler velocimeter signals is described. These signals are characterized by the fact that their frequency is proportional to the particle velocity. Possible analysis systems can consist of a frequency analyzer, a frequency tracker demodulator, or a frequency counter. This equipment is described. ESRO

N75-22731# Sandia Labs., Albuquerque, N.Mex.
MULTIPLE CAVITY LASER SYSTEM
M. J. Landry and A. E. McCarthy Dec. 1974 21 p refs
(Contract AT(29-1)-789)
(SAND-74-0147) Avail: NTIS HC $3.25

A four pulse multiple cavity laser (MCL) system was developed for use in recording time sequential holograms of fast events. The MCL system emits 25 to 40 ns laser pulses with time spacing between pulses of from 25 ns to 1.25 ms. The lasers in the MCL system were operated in their saturation mode with nearly equal to 70 to 80 mJ of output energy. Each laser output was in the TEM sub 00 mode with nearly equal to 2.0 mrad beam divergence and > 15 cm coherent length at these energy levels. Author (NSA)

N75-22732# Royal Radar Establishment, Malvern (England).
DESIGN AND PRODUCTION OF OPTICAL TWO LAYER COATINGS WITH THE AID OF SMITH'S CIRCLE DIAGRAM
N. A. Lowde Apr. 1974 48 p refs
(RRE-TN-765; BR42837) Avail: NTIS HC $3.75

The Smith's diagram of impedance used in the solution of microwave transmission line problems was applied to the design and production of dielectric two-layer coatings, which are used to reduce or enhance the reflectance of the interface in laser materials. General principles of the method are described: assimilating the thin dielectric film to a transmission line, loads being placed at the film boundaries and the monitor light source acting as the generator. Designs for two-layer coatings for glass substrate type SF4 using ZnS and MgF2, silica substrate, LiNO3 substrate, and S polarized light incident at 45 deg on a substrate with a refractive index of 1.53 are considered. The evaporation procedures are outlined. Experimental results show that the coating method based on the Smith chart gives accurate results and is flexible in that it takes into account differences in the monitoring and operating wavelengths and materials properties. It was also shown that a wide range of materials can be antireflection coated by reversing the order of the coating materials. ESRO

N75-22733# Institut Franco-Allemand de Recherches, St. Louis (France).
VIBRATIONAL ENERGY PRODUCTION BY ELECTRIC DISCHARGE IN A SUPERSONIC FLOW [LA PRODUCTION D'ENERGIE VIBRATIONNELLE PAR DECHARGE ELECTRIQUE DANS UN ECOULEMENT SUPERSONIQUE]
B. Gautier, R. Joeckle, and G. Stern 8 Jul. 1974 56 p refs In FRENCH
(Contract DRME-73/571)
(ISL-22/74) Avail: NTIS HC $4.25

To increase the CO2 laser output power, the production of vibrational energy by use of an autonomous electric discharge in a supersonic flow of CO2, N2 He mixture was studied. At generating pressure of 100 torr, up to 110 joules/g of electric energy were injected in a supersonic flow of 150 g/s before thermal blocking. Study of the discharge shows that the generated electric field enhances the vibrational energy production despite high current instabilities, and thermal losses slow down the flow. Aerodynamic considerations show the measured pressures to be higher than predicted by calculation; the reason for this are discussed with regard to boundary layers, discharge inhomogeneity, and vibrational energy relaxation. The energy conversion yield lies between 90 and 50 per cent decreasing with increasing injected energy, and measured gains are up to one percent/cm. The electric autonomous discharge thus seems a useful excitation means for power lasers although discharge yield may decrease with increased pressure or specific energy. ESRO

N75-22734# Institut Franco-Allemand de Recherches, St. Louis (France).
DEVELOPMENT OF A HIGH PERFORMANCE CARBON DIOXIDE GAS LASER MEDIUM USING AN ELECTRIC DISCHARGE IN A SUPERSONIC FLOW [ERZEUGUNG EINES CO2-LASER-MEDIUMS FUER HOHELEISTUNG DURCH EINE ELEKTRISCHE ENTLADUNG IN EINER UEBERSCHALLSTROEMUNG]
B. Gautier, R. Joeckle, H. Nett, and G. Stern 19 Apr. 1974 17 p refs In GERMAN
(ISL-CO-6/74) Avail: NTIS HC $3.25

The excitation of a carbon dioxide laser gas mixture by electric discharge in a supersonic flow at low pressure and low gas temperature was studied. The theoretic principles of a carbon dioxide laser with electric excitation are discussed, and the experimental set up is detailed. The measuring equipment is discussed along with flow measurement, electrical measurement and amplification measurement. The results, including discharge properties, flow characteristics and amplification are presented. ESRO

N75-22735# Oregon Graduate Center for Study and Research, Beaverton.
PROPAGATION OF MULTIWAVELENGTH LASER RADIATION THROUGH ATMOSPHERIC TURBULENCE Final Technical Report, 1 Dec. 1973 - 1 Sep. 1974
J. Richard Kerr, Richard A. Elliott, Philip A. Pincus, and H. Myung Nov. 1974 68 p refs
(Contract F30602-74-C-0082)
(AD-A003340; RADC-TR-74-320) Avail: NTIS CSCL 20/6

This report reviews progress on understanding the short-term statistics of microthermal turbulence fluctuations and optical/infrared scintillations, and their interrelationship. A complete analytical understanding of microthermal and scintillation data-spread and confidence intervals has been achieved, including the effects of microthermal-envelope probability distributions, integral scales, varying averaging times, and turbulence intermittency. A practical definition and model of intermittent turbulence is given and it is shown that the usual mathematical techniques may be applied. As an addendum to the preceding report on this program, which deals with turbulence effects on finite aperture laser illumination systems, the effective aperture size of an arbitrarily truncated Gaussian beam is derived. GRA

N75-22736# Aerospace Research Labs., Wright-Patterson AFB, Ohio.
A COMPARATIVE STUDY OF THREE-WAVE, FOUR-WAVE AND HIGHER-ORDER-WAVE PARAMETRIC PROCESSES Final Report, Mar. - Nov. 1974
John C. Corbin, Jr. Dec. 1974 201 p refs
(AF Proj. 7073)
(AD-A007046; ARL-74-0177) Avail: NTIS CSCL 20/5

This report examines three-wave, four-wave, and higher-order-wave parametric processes taking into account pump depletion. The theory for both three-wave forward traveling wave (FTW) and backward traveling wave (BTW) interactions is reviewed. A

comprehensive comparison of three possible down conversion systems and three up conversion systems is made based on a common set of system parameters consisting of input pump excitation and the ratio of input signal to pump photon flux. Of the down conversion systems, the system consisting of a BTW at the signal frequency and a FTW at the pump frequency most efficiently transfers energy from the pump wave for any given level of pump excitation or ratio of signal/pump photon flux. In up conversion, the system consisting of two forward traveling waves at the pump and signal frequencies is the most efficient. GRA

N75-22737# Joint Inst. for Lab. Astrophysics, Boulder, Colo.
RESEARCH IN LASER PROCESSES Semiannual Technical Report, 1 Jul. 1974 - 31 Jan. 1975
A. V. Phelps 27 Feb. 1975 21 p
(Contract N00014-67-A-0405-0008; ARPA Order 2683)
(AD-A006986) Avail: NTIS CSCL 20/5

The four projects being carried out in the area of laser processes under this contract are summarized. Project titles include: stability of discharges in weakly ionized gases; electron transport and ionization coefficients; generation and interpretation of molecular continuum radiation; scattering and transport of resonance radiation in gases. GRA

N75-22738# Aerospace Corp., El Segundo, Calif. Lab. Operations.
THE RESALE CHEMICAL LASER COMPUTER PROGRAM
W. Dallas Adams, Emily B. Turner, James F. Holt, David G. Sutton, and Harold Mirels 20 Feb. 1975 162 p refs
(Contract F04701-74-C-0075)
(AD-A007058; TR-0075(5530)-5; SAMSO-TR-75-60) Avail: NTIS CSCL 20/5

This report describes the RESALE computer program for the calculation of laser action in a chemically reacting gas. The program is applicable to either a one-dimensional steady flow or a time-dependent quiescent gas. RESALE uses either a constant-gain method or a numerical integration to obtain the intensity and to account for population changes due to lasing. Vibrational populations are treated individually and thus are not in equilibrium. Rotational populations, however, are assumed to be in a Boltzmann distribution at the translational temperature. For continuous-wave lasers, it is possible to include the effects of diffusion of the reactants. The formulation of the equations, the numerical methods used, and the preparation of input are described in detail. GRA

N75-22739# Physical Sciences, Inc., Wakefield, Mass.
ANALYTIC CALCULATIONS FOR ELECTRICALLY EXCITED D2/HCl LASER Technical Report, 1 Aug. - 31 Oct. 1974
R. Taylor, G. Caledonia, P. Lewis, and J. D. Teare 3 Feb. 1975 43 p refs
(Contract N00014-75-C-0035)
(AD-A006967; PSI-TR-18) Avail: NTIS CSCL 20/5

Analytical modeling of an electric discharge excited D2/HCl gas dynamic laser has been performed. This model uses a Boltzmann transport code to model the electric discharge in pure D2 or H2 or in D2 or H2/rare gas mixtures. A one-dimensional stream tube code with finite vibrational kinetics and with a specified pressure distribution is used to calculate the cavity conditions of HCl vibrational populations and small signal gain. Instantaneous mixing of HCl is assumed in the nozzle region. This model is applied to a nominal experimental run for the NRL laser device. It is concluded that the discharge calculations are in close agreement with the available data, but that incomplete mixing of the HCl in the experiment precludes meaningful comparison of the cavity results. GRA

N75-22740# Physical Sciences, Inc., Wakefield, Mass.
AEROSOL PROPAGATION EFFECTS Final Report, 15 Jan. - 14 Sep. 1974
G. E. Caledonia and J. D. Teare 13 Sep. 1974 100 p refs
(Contract N00014-74-C-0254; ARPA Order 2439)
(AD-A006676; PSI-TR-13) Avail: NTIS CSCL 07/4

A model for the prediction of the temperature and vapor fields created about a small water droplet undergoing irradiation by a laser beam has been developed. Time dependent and steady state solutions of the model are discussed, as well as the possible effects of a number of aerosol properties not included in the model. Estimates of characteristic phase shifts to be expected in propagating through standard atmospheric aerosol distributions are also presented. While the model is quite general, the calculations in this report are limited to DF laser wavelengths. GRA

N75-22741# Harry Diamond Labs., Washington, D.C.
LASER TARGET DESIGNATOR BEAM IMPROVEMENT
Thomas J. Gleason, Robert M. Curnutt, and John S. Kruger Dec. 1974 25 p refs
(DA Proj. 1X6-28012-D-628)
(AD-A007139; HDL-TR-1664) Avail: NTIS CSCL 20/5

Thermal focusing contributes to laser beam divergence which is a problem in the design of laser target designators. Measurements of the thermal focusing induced in a neodymium-yttrium aluminum garnet laser rod by input powers typical of target designators are described. The application of such measurements in the design of laser resonant cavities is illustrated. GRA

N75-22742# Wayne State Univ., Detroit, Mich. Research Inst. for Engineering Science.
ENERGY TRANSFER PROCESSES IN MOLECULAR LASERS Final Technical Report, 26 Jan. 1971 - 30 Jun. 1974
E. R. Fisher, G. Abraham, A. Lightman, L. Morgan, and S. Yarema 6 Jan. 1975 126 p refs
(Contract DAHC04-74-G-0036; Grant DA-ARO(D)-31-124-73-G179)
(AD-A007241; ARO-11570-4-P) Avail: NTIS CSCL 20/5

This final report details neutral energy transfer and molecular plasma models which have been developed. These numerical models are exercised on pulsed CO lasers both with and without gas additives. The important phenomenology operative in the CO laser is indicated. Experiments are also presented on the operating characteristics of a CW CO laser both with and without gas additives. These experimental measurements are discussed in the framework of the important plasma and neutral chemistry processes. Sections included are entitled: Modeling of a pulsed CO/N2 molecular laser system; Modeling of a pulsed CO/N2 molecular laser system: effect of temperature and mixture components; and calculations on the electron energy distribution in a molecular laser plasma. GRA

N75-22743# ILC Technology, Inc., Sunnyvale, Calif.
PRODUCTION ENGINEERING MEASURE FOR OPTICAL PUMPS FOR LASERS Quarterly Report, Jul. - Sep. 1974
Robert Maynard and Hal Sowers Dec. 1974 36 p
(Contract DAAB05-73-C-2078)
(AD-A006646; R-ILC-73-22/5) Avail: NTIS CSCL 20/5

This program is directed toward establishing a capability for manufacturing flashlamps that are to be used as optical pumps for Nd:YAG laser systems. This report describes the work carried out during the fifth quarter of the program. The four synthetic fused quartz ETS lamps were life tested in the external trigger mode. The lamps exceeded the minimum laser efficiency requirement at the one million shot point when tested in the simmer mode, but the efficiency was marginal when operated in the external trigger mode. All ETS lamps tested passed the vibration and shock tests. All ETS lamps tested passed the laser output variation test at the one million shot point when operated in both the simmer mode and the external trigger mode. All ETS lamps passed the anti-coincidence pulse requirement at the one million shot point. GRA

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N75-22744*# Marquardt Corp., Van Nuys, Calif.
LINE FLUID ACTUATED VALVE DEVELOPMENT PROGRAM Final Report
R. A. Lynch Jan. 1975 126 p refs
(Contract NAS9-13684)
(NASA-CR-141780; TMC-3293-6-3) Avail: NTIS HC $5.75 CSCL 13K

The feasibility of a line-fluid actuated valve design for potential application as a propellant-control valve on the space shuttle was examined. Design and analysis studies of two prototype valve units were conducted and demonstrated performance is reported. It was shown that the line-fluid actuated valve concept offers distinct weight and electrical advantages over alternate valve concepts. Summaries of projected performance and design goals are also included. L.B.

N75-22745*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DOT/NASA COMPARATIVE ASSESSMENT OF BRAYTON ENGINES FOR GUIDEWAY VEHICLES AND BUSSES. VOLUME 2: ANALYSIS AND RESULTS
Washington 1975 284 p refs
(NASA-SP-354-Vol-2) Avail: NTIS HC $8.75 CSCL 21G

Gas turbine engines were assessed for application to hear duty transportation. A summary of the assumptions, applications, and methods of analysis is included along with a discussion of the approach taken, the technical program flow chart, and weighting criteria used for performance evaluation. The various engines are compared on the bases of weight, performance, emissions and noise, technology status, and growth potential. The results of the engine screening phase and the conceptual design phase are presented. Author

N75-22746*# National Aeronautics and Space Administration. Pasadena Office, Calif.
SOLAR POWERED PUMP Patent Application
Charles C. Kirsten, inventor (to NASA) (JPL) Filed 9 Apr. 1975 19 p
(Contract NAS7-100)
(NASA-Case-NPO-13567-1; US-Patent-Appl-SN-566493) Avail: NTIS HC $3.25 CSCL 13I

A low cost water pump suitable for use in agricultural irrigation in underdeveloped regions is disclosed. The pump is adopted to use unconcentrated sunlight as a source of energy and atmospheric air as a working fluid for intermittently delivering a stream of water from a given source. NASA

N75-22747*# National Aeronautics and Space Administration. Pasadena Office, Calif.
STIRLING CYCLE ENGINE AND REFRIGERATION SYSTEMS Patent Application
Walter H. Higa, inventor (to NASA) (JPL) Filed 5 May 1975 23 p
(Contract NAS7-100)
(NASA-Case-NPO-13613-1; US-Patent-Appl-SN-574208) Avail: NTIS HC $3.25 CSCL 13I

A Stirling cycle heat engine is described in which displacer motion is controlled as a function of the working fluid pressure and a substantially constant pressure. The heat engine includes an auxiliary chamber at the constant pressure, and an end surface of a displacer piston is disposed in the auxiliary chamber. During the compression portion of the engine cycle when the fluid pressure rises above the constant pressure, the displacer forces the working fluid to pass from the cold chamber to the hot chamber of the engine. During the expansion portion of the engine cycle the heated working fluid in the hot chamber does work by pushing down on the engine's drive piston. As the working fluid pressure drops below the constant pressure, the displacer forces most of the working fluid in the hot chamber to pass through the regenerator to the cold chamber. The engine is easily combinable with a refrigeration section to provide a refrigeration system in which the engine's single drive piston serves both the engine and the refrigeration section. NASA

N75-22748*# National Aeronautics and Space Administration. Pasadena Office, Calif.
MOTION RESTRAINING DEVICE Patent Application
Allen G. Ford, inventor (to NASA) (JPL) Filed 30 Apr. 1975 18 p
(Contract NAS7-100)
(NASA-Case-NPO-13619-1; US-Patent-Appl-SN-572990) Avail: NTIS HC $3.25 CSCL 13I

A motion-restraining device for dissipating at a controlled rate, the force of a moving body was developed. The device is characterized by a drive shaft adapted to be driven in rotation by a moving body and employs a three-stage motion-multiplying gear train. The force of a moving body may be without resorting to the use of conventional motion-control devices such as escape wheels, two arm pallets, and comparable components. NASA

N75-22749# Advisory Group for Aerospace Research and Development, Paris (France).
ADVANCED MANUFACTURING METHODS AND THEIR ECONOMIC IMPLICATIONS: SOME PILOT PAPERS ON POWDER METALLURGY AND JOINING
Mar. 1975 112 p refs In ENGLISH; partly in FRENCH
(AGARD-R-627) Avail: NTIS HC $5.25

A systematic examination of the field of advanced fabrication techniques is reported, together with an analysis of the impact of these new procedures on costs. Six papers, given before the AGARD Structures and Materials Panel in the spring and fall of 1974, are contained in this document. These six papers explore the latest state-of-the-art and the potentials for future development of various methods of fabrication of aerospace hardware. Analyzed in these papers are such areas as metal joining methods, production techniques for dispersion-strengthened materials and various aspects of powder metallurgy. The six papers contained in this report constitute a pilot effort by the Structures and Materials Panel to determine the direction of future work of the panel in this important field. For individual titles, see N75-22750 through N75-22755.

N75-22750 Air Force Materials Lab., Wright-Patterson AFB, Ohio. Metals Branch.
POWDER METALLURGY PRODUCTION PROCESSES
Larry P. Clark *In* AGARD Advan. Manuf. Methods and their Econ. Implications Mar. 1975 18 p (For availability see N75-22749 14-37)

A review of the current status of powder metallurgy (P/M) technology and its application to aircraft engines and recommendations of the Powder Metallurgy Seminar are discussed. The state-of-the-art in powder production, consolidation methods, secondary operations and NDE is discussed for titanium, aluminum and superalloy P/M products. Also, a summary of pertinent United States Air Force manufacturing technology programs in P/M is presented. Author

N75-22751 Air Force Materials Lab., Wright-Patterson AFB, Ohio. Metals Branch.
A REVIEW OF SELECTED MANUFACTURING TECHNOLOGY PROGRAMS FOR METALS JOINING
Fred R. Miller *In* AGARD Advan. Manuf. Methods and their Econ. Implications Mar. 1975 33 p refs (For availability see N75-22749 14-37)

An overview is presented of the United States Air Force Materials Laboratory, Manufacturing Technology Division's involvement in the development of a variety of advanced metals joining processes. Processes discussed in this paper include electron beam welding, plasma arc welding, inertia welding, weldbonding and diffusion bonding. Author

N75-22752 Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Porz (West Germany). Inst. fuer Werkstoff-Forschung.
PROCESSING OF DISPERSION HARDENED MATERIALS
G. Wirth *In* AGARD Advan. Manuf. Methods and their Econ. Implications Mar. 1975 16 p refs (For availability see N75-22749 14-37)

Production methods for dispersion-strengthened metals and alloys, especially materials for high-temperature applications, are reviewed including commercial as well as advanced experimental techniques. Their effect on mechanical properties and economic aspects are discussed. Because of the nearly exclusive application of powder-metallurgical techniques to the production of dispersion-strengthened materials, this production method preferably is discussed. Also, special strengthening mechanisms are pointed out. Comparisons are made to other high-temperature strengthening approaches as directional solidification of eutectic alloys. Advanced processes like ZAP, applied to mechanically alloyed dispersion-strengthened age-hardenable superalloys, cancel the complicated and expensive thermomechanical treatments and seem to shift the dispersion strengthening up to a level of strength

and economy comparable to the directional solidification of eutectics. Author

N75-22753 Wiggin (Henry) and Co. Ltd., Hereford (England).
PRODUCTION OF SUPERALLOYS FROM POWDERS
F. A. Thompson and D. L. Williams *In* AGARD Advan. Manuf. Methods and their Econ. Implications Mar. 1975 15 p refs (For availability see N75-22749 14-37)

Powder metallurgical techniques are reported, when applied to superalloy production, overcome many of the problems facing the alloy developers for materials to use in the critical high temperature regions of aircraft gas turbine engines. It is shown not only do they overcome many technical problems, but in the future the powder techniques have the potential to increase material yields and processing efficiency thus leading to reduced costs. Author

N75-22754 Atomic Energy Research Establishment, Harwell (England). Process Technology Div.
TITANIUM POWDER METALLURGY
P. W. Sutcliffe and P. G. Mardon *In* AGARD Advan. Manuf. Methods and their Econ. Implications Mar. 1975 17 p refs (For availability see N75-22749 14-37)

The current technical and economic status of titanium powder metallurgy is surveyed. Relevant details of conventional wrought titanium route such as market size, distribution, scrap and loss generation and material utilization are summarized. Methods by which titanium and titanium alloy powders are presently produced such as sponge, fused salt electrolysis, hydride-dehydride, rotating electrode and centrifugal shot casting processes are discussed together with typical powder properties. Possible ways of fabricating such powders from simple press and sinter route through to the variety of hot consolidation processes, now being employed to achieve properties equivalent to wrought material, are considered with examples of mechanical properties so far achieved. Some preliminary economic considerations are discussed including present and possible future powder costs; the fabrication costs available to date and their implications upon the likely level of finished part cost of a given quality are also noted. Author

N75-22755 Societe Nationale d'Etude et de Construction de Moteurs d'Aviation, Paris (France). Lab. de la Direction Technique.
WORK ON THE CALCINATION OF HEAT RESISTANT NICKEL BASED ALLOYS [MISE EN OEUVRE DES ALLIAGES FRITTES BASE NICKEL RESISTANT A CHAUD]
Pierre Lescop *In* AGARD Advan. Manuf. Methods and their Econ. Implications Mar. 1975 5 p In FRENCH (For availability see N75-22749 14-37)

The products obtained by powder metallurgy are reported showing that nickel based alloys possess good mechanical properties. The development of new techniques and the high cost of materials are discussed. Transl. by M.C.F.

N75-22756# Pisa Univ. (Italy). Ist. di Aeronautica.
A NEW TYPE OF HYDROSTATIC THRUST BEARING WITH SELF REGULATED FLOW [UN NUOVO TYPE DI CUSCINETTO ID ROSTATICO DI SPINTA A DOPPIO EFFETTO: IL CUSCINETTO AUTOREGOLATORE DI PORTATA]
R. Bassani 1974 14 p refs In ITALIAN Presented at 2d Natl. AIMETA Congr., Naples, 16-19 Oct. 1974
(Rept-48) Avail: NTIS HC $3.25

An opposed-pad hydrostatic bearing is described, which is supplied by one pump. The distribution of equal flow rates in two pockets, is made possible by its special shape. The principles, which allow continuous, automatic flow regulation are based on the fact that the fluid passes through equal hydraulic resistances in suppling the two pockets, regardless of the relative positions of the shaft and the bearing. The derived stiffness and pumping power indicate that these bearings are as efficient as those supplied by two pumps. Author

N75-22757# Sandia Labs., Livermore, Calif.
CASE HISTORY OF A JOINING BY PLATING APPLICATION
J. W. Dini and H. R. Johnson Oct. 1974 16 p refs Presented at 11th Airlines Plating Forum, San Francisco, 4 Feb. 1975
(Contract AT(29-1)-789)
(SAND-74-8656; Conf-750203-1) Avail: NTIS HC $3.25

An application wherein large aluminum parts were joined to stainless steel parts by using electroplating is described. Mechanical, thermal, and corrosion tests used to prove the viability of the process are reviewed as are certification procedures used for finished parts. Spin-off from this work resulted in a joining technique for situations where conventional methods are inadequate. Author (NSA)

N75-22758# Commissariat a l'Energie Atomique, Saclay (France).
INFLUENCE OF THE FABRICATION CONDITIONS IN THE MECHANICAL PROPERTIES AND PARTICULARLY ON THE CREEP RESISTANCE OF ZIRCALOY CLADDINGS
J. M. Frenkel 1974 18 p refs In FRENCH Presented at the Mech. and Met. Colloq., Tarbes, France, 7 Mar. 1974
(CEA-Conf-2606; Conf-740350-1) Avail: ERDA Depository Libraries HC $4.00

The effect of texture on mechanical properties of Zircaloy sheets and tubes is reported along with factors affecting the creep resistance of Zircaloy claddings. The resistance to transverse creep increased very sharply with the final annealing temperature. The resistance to longitudinal creep decreased with annealing temperature. It is concluded that the texture responsible for the anisotropy evolves with the annealing conditions. The final cold-working rate is an important parameter as results show that the resistance to transverse creep is much better when the cold working rate is low. The effect of cold working on longitudinal creep in general disappears only when thermal treatments cause total recrystallization. NSA

N75-22759# Commissariat a l'Energie Atomique, Grenoble (France).
PREPARATION OF HAFNIUM CARBIDE BY CHEMICAL DEPOSITION IN VAPOR PHASE
D. Hertz, J. Spitz, and J. Besson 21 Mar. 1974 24 p refs In FRENCH Presented at the 8th Plansee seminar: Heat Resisting and Wear Resisting Sintered Mat., Reutte, Austria, 27 May 1974
(CEA-Conf-2693; Conf-740570-2) Avail: ERDA Depository Libraries HC $4.25

Deposition of HfC on substrates of graphite, Mo, WC-Co cermets, and HfC frits by reaction of HfCl4 and methane in the presence of H2 was studied. Effects of the temperature (1200 to 1500 C), H2/CH4 ratio (0 to 100), and CH4/HfCl4 ratio (0 to 20) on the nature, composition, and morphology of the material deposited were determined. The speed of growth of the deposited phase is a function of the H2/CH4 ratio. The nature and composition of the material deposited are functions of the temperature and of the (C/Hf) ratio of the gaseous phase. Conditions under which stoichiometric HfC can be obtained are determined and tabulated. Adherence of the HfC to the substrate is excellent when the carbide contains no free C. The porosity is very low and the hardness varies with the nature and composition of the deposited material. Analysis of the deposition curves showed the existence of two different deposition mechanisms for both C and Hf. NSA

N75-22760# Office National d'Etudes et de Recherches Aerospatiales, Toulouse (France). Dept. d'Etudes et de Recherches en Technologie Spatiale.
USE OF THIN FILMS FOR AN ESPECIALLY HOT IN SPACE SATELLITE COATING NAMED SOLAR ABSORBER [APPLICATION DES COUCHES MINCES A UN TYPE DE REVETEMENT POUR SATELLITE, PARTICULIEREMENT CHAUD DANS L'ESPACE, APPELE ABSORBEUR SOLAIRE]
M. Riboulet Nov. 1974 13 p refs In FRENCH
(ONERA-DERTS-NT-04-4) Avail: NTIS HC $3.25

The various methods used for satellite thermal control by solar energy absorbers are reviewed, and a short bibliography is provided. In view of the high absorptance/emittance ratios required for the French D5A satellite, the Koltun method is favored. Theoretical considerations make it possible to determine the optimal thicknesses for a double layer under normal incidence with regard to mechanical constraints required for the specific application considered. The constraints are detailed and lead to a 0.5 mm thick polished Al substrate, a NiCr (20-80), 150 Angstrom

thick first layer, and an SiO, 800 Angstrom thick interferential layer. The production engineering procedures are detailed. ESRO

N75-22761# Nederlands Scheeps-Studiecentrum TNO, Delft. Afdeling Techniek.
CORROSIVITY MONITORING OF CRANKCASE LUBRICATING OILS FOR MARINE DIESEL ENGINES
L. M. Rientsma and H. Zeilmaker (Tech. Univ. Eindhoven, Neth.) Oct. 1974 17 p refs
(Rept-200-M; TDCK-65873) Avail: NTIS HC $3.25; Ned. Scheepsstudiecentrum TNO, Delft Dfl. 10

For qualification of crankcase lubrication oils in ship diesel engines the total acid number, strong acid number and total base number were determined. It is shown that these numbers have a low degree of reproducibility. A more rapid and reliable method for assessing the corrosive properties of a used oil, using the conductivity relation of ultrathin copper layers on an inert base materials, was developed. Encouraging results were obtained. ESRO

N75-22762# Ball Bros. Research Corp., Boulder, Colo.
LONG LIFE LUBRICATION SYSTEM
G. H. Ahlborn, J. T. Hinricks, and B. J. Perrin Paris ESRO 1975 23 p refs Presented at the European Space Tribology Symp., Frascati, Italy, 9-11 Apr. 1975
(TN-75-07) Avail: NTIS HC $3.25

Design techniques for achieving long life with fluid lubricants are discussed. Included are descriptions of hardware for fluid lubrication, fluid lubricant properties, lubricant application techniques, and replenishment systems. ESRO

N75-22763# Air Force Materials Lab., Wright-Patterson AFB, Ohio.
APPROACHES TO THE ACCELERATED LIFE TESTING OF LUBRICANTS FOR SPACE
W. E. Ward and R. J. Benzing Paris ESRO 1975 20 p Presented at the European Space Tribology Symp., Frascati, Italy, 9-11 Apr. 1975
Avail: NTIS HC $3.25

The multiphase program which was undertaken to develop the accelarated life test required to enable selection of improved lubricants for space systems is described. A survey of lubrication system malfunctions or failures in a number of spacecraft systems identified twelve possible failure modes. Included among these are lubricant degradation, lubricant dewetting, slip ring and brush wear, improper lubricant transfer, inadequate lubricant quality, torque variations, and cage wear. As an example, the philosophy of the approach utilized in the investigation and evaluation of failure phenomena of lubricant degradation to anomolus space vehicle performance is described. Author (ESRO)

N75-22764# National Centre of Tribology, Risley (England). European Space Tribology Lab.
TRIBOLOGY TESTS FOR SATELLITE APPLICATION: SIMULATION OF THE SPACE ENVIRONMENT
E. J. Robbins Paris ESRO 1975 29 p refs Presented at the European Space Tribology Symp., Frascati, Italy, 9-11 Apr. 1975
(Contract ESTEC-1560/72-SK)
Avail: NTIS HC $3.75

It is shown that many mechanisms in satellites, even when in a geostationary orbit at 36,000 km, are likely to be in an environment of water vapor and other desorbed vapors. The influence of this atmosphere in tribological components is considered, and the consequent validity of accelerated tests assessed. It is concluded that laboratory tests are generally valid, even though the environment is not always correctly simulated. However there are some areas of doubt. These include the influence of trace quantities of water vapor on lead bronze cages used in ball bearings lubricated with thin films of lead, and the possiblity of the formation of insulating layers on slip rings by reaction with organic vapors and volatile low molecular weight silicones. The effects of electron and proton bombardment are summarized. Failure to simulate zero gravity may be significant when considering the effects of wear debris from slip rings and brushes. It is emphasised that it is important to simulate the thermal environment, including temperature gradients, when testing satellite mechanisms. Author (ESRO)

N75-22765# Marconi Space and Defence Systems Ltd., Camberley (England). Space and Instrumentation Div.
LUBRICATION BY LEAD FILMS. A SURVEY OF EXISTING AND PROPOSED APPLICATIONS
P. J. Donnell Paris ESRO 1975 37 p refs Presented at the European Space Tribology Symp., Frascati, Italy, 9-11 Apr. 1975 Sponsored in part by Min. of Defence and ESRO
Avail: NTIS HC $3.75

Details are given of relevant performance parameters for spacecraft mechanisms using lead as a lubricant and summary of component test data is given. It is concluded that lead lubrication is a versatile technique, which can be employed, to extend the design performance of many more mechanisms used in space than are currently being serviced by this technique.
Author (ESRO)

N75-22766# National Centre of Tribology, Risley (England). European Space Tribology Lab.
LEAD FILM LUBRICATION IN AIR AND VACUUM
M. J. Todd Paris ESRO 1975 33 p refs Presented at the European Space Tribology Symp., Frascati, Italy, 9-11 Apr. 1975
(Contract ESTEC-1610/72-SK)
Avail: NTIS HC $3.75

The behavior and failure mechanism of lead-filmed bearings in air and the torque noise of rotating and of oscillating bearings in vacuo are discussed. Additionally, the continuous though mild wear between a lead-filmed disc and a clean ball is demonstrated, together with confirmation from the electron microprobe that an extremely thin and patchy film of lead is still able to provide useful protection from severe wear. Author (ESRO)

N75-22767# National Centre of Tribology, Risley (England). European Space Tribology Lab.
PERFORMANCE OF DRY LUBRICATED SLIP RINGS FOR SATELLITE APPLICATIONS
A. J. Walton, H. E. Hintermann (Lab. Suisse de Rech. Horlogeres), and M. Mailatt (Lab. Suisse de Rech. Horlogeres) Paris ESRO 1975 23 p refs Presented at the European Space Tribology Symp., Frascati, Italy, 9-11 Apr. 1975
(Contract ESTEC-1560/72-SK)
Avail: NTIS HC $3.25

Results of a series of tests using a European brush material containing molybdenum disulfide rubbing on either silver or silver plated slip rings are reported. Measurements include electrical noise levels for two typical solar paddle mechanisms and for a test rig operating at 32 rev/min, wear in different rigs as 32 rev/min and at 480 rev/min, effects of brush pressure on noise, and effects of brush orientation on wear. Author (ESRO)

N75-22768# British Aircraft Corp., Stevenage (England).
A POST-TEST STUDY OF GREASE LUBRICATED SATELLITE DE-SPIN MECHANISM BEARINGS
B. H. Baxter Paris ESRO 1975 24 p refs Presented at the European Space Tribology Symp., Frascati, Italy, 9-11 Apr. 1975
Avail: NTIS HC $3.25

The lubricant residues from two satellite antenna despin bearings, tested under simulated space conditions were examined by micro infrared and gas chromatography. It was shown that the major acid in the grease thickening agent (12 hydroxy stearic acid) is lost during running. Evidence was presented which links the loss of this acid to the low pressure running conditions of the test. Author (ESRO)

N75-22769# Marconi Space and Defence Systems Ltd., Camberley (England). Space and Instrumentation Div.
DESIGN AND PERFORMANCE OF ELECTRICAL CONTACTS FOR USE IN ULTRA-HIGH VACUUM
K. R. Dalley and P. J. Donnell Paris ESRO 1975 48 p refs Presented at the European Space Tribology Symp., Frascati, Italy, 9-11 Apr. 1975 Sponsored in part by Min. of Defence and ESRO
Avail: NTIS HC $3.75

Work carried out on the design and testing of sliding electrical contacts for use in ultrahigh vacuum is described. Reference is made to applications involving, low solar array drives and medium despin mechanisms, speed requirements. Many aspects of slip-ring

technology are described including material selection, long life testing, brush design, and performance. Author (ESRO)

N75-22770# Marconi Space and Defence Systems Ltd., Camberley (England).

PROCUREMENT-TREATMENT AND EVALUATION OF RECIRCULATING BALL SCREWS FOR USE IN VACUUM

D. E. Stewart and R. H. Bentall (ESTRC, Noordwijk, Neth.) Paris ESRO 1975 22 p refs Presented at the Eurpoean Space Tribology Symp., Frascati, Italy, 9-11 Apr. 1975 Sponsored by ESRO

Avail: NTIS HC $3.25

A ball screw was selected for spacecraft application, and backlash and torque were measured in vacuum. The test indicated that for the duty cycle required 2,500 oscillations. There was insignificant change of characteristics, less than 0.1 micrometer increase in backlash for 5000 oscillations at 3 times the required amplitude and no change of friction value. It is suggested that much longer wear lives can be obtained from lead plated ball screws. ESRO

N75-22771# Laboratoire Suisse de Recherches Horlogeres, Neuchatel (Switzerland).

BEARINGS FOR EXTREME ENVIRONMENTS

H. Gass, H. E. Hintermann, G. Stehle (Roulements Miniatures S. A.), and H. M. Briscoe (ESRTC, Noordwijk, Neth.) Paris ESRO 1975 20 p refs Presented at the European Space Tribology Symp., Frascati, Italy, 9-11 Apr. 1975 Partly sponsored by ESRO

Avail: NTIS HC $3.25

Dry lubricated bearings for applications under extreme environmental conditions were developed. Results with ball bearings assembled from bearing rings coated with hard carbide layers, steel balls, and cages of various materials with self-lubricating properties are reported. The role of the hard diffusion barrier layer and the transferred cage material is analyzed. Some aspects concerning fatigue stress in the hard layer-sublayer region are considered with respect to bearing lifetime. Author (ESRO)

N75-22772# Centre National d'Etudes Spatiales, Toulouse (France).

WEAR OF A LEAD FILM UNDER CONDITIONS OF SMALL AMPLITUDE OSCILLATORY CONTACT

R. H. Bentall (ESRTC, Noordwijk, Neth.), J. C. Hennequin, and M. Romero (Centre d'Etudes et de Rech. en Technol. Spatiale, Toulouse) Paris ESRO 1975 21 p refs Presented at the European Space Tribology Symp., Frascati, Italy, 9-11 Apr. 1975 Sponsored by ESRO

Avail: NTIS HC $3.25

An experimental study was made of the behavior of lead films deposited on conformal grooves loaded against a steel ball and made to oscillate through a small angle in a vacuum environment. The experimental device is described and scanning electron microscope photographs are presented which show the nature of the deformation of the lead film. Results are given for grooves of various conformities and the influence of lead thickness is examined. The experiments provide comparative values of the friction, expressed as a logarithmic damping decrement, for the different geometries and display features of the contact which are in good qualitative agreement with the contact theories of Hertz and the microslip extension developed by Johnson. Author (ESRO)

N75-22773# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany).

FUNCTIONAL PROPERTIES OF SLIDING ELECTRICAL CONTACTS AT CONTINUOUS AND DISCONTINUOUS LOW SPEED OPERATION AT ULTRAHIGH VACUUM

Hans-Christian Goetting and Walter Wilkens Paris ESRO 1975 27 p refs Presented at the European Space Tribology Symp., Frascati, Italy, 9-11 Apr. 1975

Avail: NTIS HC $3.75

Lubricated and unlubricated sliding element electric contacts were investigated in ultrahigh vacuum at very low speeds corresponding to one revolution per day only. Continuous and discontinuous drive was applied at different electrical and mechanical loads. Apart from vacuum the contact performance was also examined in air since this is of interest for pre-launch testing. Results are given with respect to contact resistance, electrical and mechanical noise, friction, and wear. Possibilities of test acceleration are pointed out. Author (ESRO)

N75-22774# Hollandse Signaalapparaten N. V., Hengelo (Netherlands).

APPLICATION SPIRAL-GROOVE BEARINGS TO SPACE MACHINERY

U. Vanderwal Paris ESRO 1975 26 p refs Presented at the European Space Tribology Symp., Frascati, Italy, 9-11 Apr. 1975

Avail: NTIS HC $3.75

Engineering data and test results are provided for a type of spiral groove, grease-lubricated, satellite momentum wheel bearing. Relationships are derived between requirements in the satellite specification (ESRO's Orbital Test Satellite) and the properties of the spiral-groove bearing. How spiral groove, grease-lubricated bearings can be designed to perform better with respect to the original calculations concerning low power absorption at lower temperatures and high stiffness at higher temperatures is explained. ESRO

N75-22775# Dornier-System G.m.b.H., Friedrichshafen (West Germany).

TRIBOLOGICAL DESIGN OF THE MEDIUM SPEED MECHANISM (MSM)

M. Granzow Paris ESRO 1975 21 p Presented at the European Space Tribology Symp., Frascati, Italy, 9-11 Apr. 1975

Avail: NTIS HC $3.25

The layout of the tribological design of an oil vapor lubricated antenna despin mechanism is presented. Investigations were made of all parameters necessary to select the best suited oil. An engineering model was built and tested on qualification level. Author (ESRO)

N75-22776# British Steel Corp., Sheffield (England). Information Services.

ROLL CLADDING OF LOW ALLOY AND MILD STEEL PLATES

J. M. Arrowsmith and I. M. Caskie Aug. 1974 10 p refs (PB-236353/9; GS/PROD/9/16/74/C) Avail: NTIS HC $3.25 CSCL 13H

The advantages of clad plates are considered and the history of their development briefly traced. The physical aspects of bonding are defined and several different process routes for production of clad plates are described, with emphasis on the original Colclad process. The bond zone microstructure is considered in some detail as revealed by optical and electron microscopy. The use of explosive bonding and its effect on the bond zone microstructure of Colclad plate is discussed. Arguments are developed and evidence is produced to show that Colclad plate made by both old and new process routes has a inherent resistance to hydrogen attack of the bond zone in petrochemical applications involving hydrogen at high pressure and temperature. GRA

N75-22777# IIT Research Inst., Chicago, Ill.

COLLISION AVOIDANCE RADAR BRAKING SYSTEM INVESTIGATION, PHASE 1 Final Report, 11 Jun. - 11 Sep. 1971

G. Demos, S. Kazel, R. Carlson, O. Viergutz, and D. Morita Dec. 1974 307 p

(Contract DOT-HS-4-00935)

(PB-238486/5; IITRI-E6306-1; DOT-HS-801-309) Avail: NTIS HC $9.25 CSCL 13F

The subject areas receiving special attention in the study, were; (1) identification and analysis of the manner in which driver, driving environment, and vehicle characteristics in conjunction with radar braking objectives, affect the requirements of the system, (2) characterization of the subsystems of the radar braking concepts as to the function, tradeoffs, alternative implementation, and technology limitations, (3) appraisal of the current state-of-the-art in radar braking techniques and systems, (4) generation of candidate braking systems and radar techniques, and (5) analysis of accident statistics to determine the relative benefits of the candidate system configurations. GRA

N75-22778# Bell Aerospace Co., Buffalo, N.Y.
US ARMY LOGISTIC VOYAGEUR HARDENING ANALYSIS, 2 Final Report, Jun. - Nov. 1974
Nov. 1974 176 p ref
(Contract DAAK02-74-C-0317)
(AD-A003274; BAC-7467-950003) Avail: NTIS CSCL 13/10

This study delineated a fendering systems to adequately protect the Voyageur while alongside the cargo containership. Cabin acoustic improvement showed modification required to the commercial cabin to attain an internal noise level of 74 dB (P.S.I.L) and for 80 to 82 dB (P.S.I.L.). Container tie-down study covers cable lashing system required to secure the container to the deck of the logistic Voyageur. This study establishes loading criteria applicable to cargo restraint on an air cushion vehicle. Communication navigation system determined the avionics set required to provide the Voyageur with suitable communications, collision avoidance and navigation systems for limited visibility operation. Program definition for a two prototype and twenty-eight acquisition craft program are covered. GRA

N75-22779# Illinois Univ., Urbana. Dept. of Civil Engineering.
THE EFFECT OF LACK OF PENETRATION DEFECTS ON STATIC TENSILE BEHAVIOR OF HIGH STRENGTH STRUCTURAL STEEL WELDMENTS Final Report
F. V. Lawrence, Jr., E. P. Cox, and E. M. Honig, Jr. Feb. 1975 43 p refs
(Contract DACA88-73-C-0013; DA Proj. 4DM-72801-AOK-1)
(AD-A007132; CERL-IR-M-123) Avail: NTIS CSCL 13/5

This paper investigates the effect of lack of penetration (LOP) in welded T-1 steel plates on tensile properties. Tensile tests of welded plates having varying sizes of LOP were conducted and monitored for acoustic emissions. Fracture surfaces were examined. Using a documented computer program the J integral of fracture mechanics was evaluated at several points for each specimen. An anticipated decrease in tensile strength and ductility with increasing LOP was observed. By using base metal yield and tensile strength, a net section criterion and a limit load stress, four modes of fracture behavior can be identified. These results express quantitative relationships between LOP defect size and tensile properties. The range of allowable LOP defect sizes for which tensile strength may not be seriously affected is thus established. GRA

N75-22780# SKF Industries, Inc., King of Prussia, Pa. Research Lab.
EFFECT OF SURFACE AND MECHANICAL PROPERTIES ON SILICON NITRIDE BEARING ELEMENT PERFORMANCE Final Report
H. Dalal, D. Hahn, and W. L. Rhoads Feb. 1975 76 p refs
(Contract N00019-74-C-0168)
(AD-A006917; SKF-AL75-T002) Avail: NTIS CSCL 13/9

The report discusses the importance of understanding the extent of surface damage caused during the manufacture of bearing surfaces on ceramics. The likely impact of the damaged surface on the usefulness of ceramics as rolling bearing materials is presented. The results of flat-washer rolling-contact fatigue tests signify the role of surface interactions in a steel-silicon nitride contact on the life of the contact. The variables evaluated include lubricant viscosity, surface finish of the silicon nitride washer, type of contact (line or point) and hardness of the steel rollers. The effect of the lower density and higher elastic modulus of silicon nitride on bearing fatigue life was analytically evaluated. The analysis shows that silicon nitride rolling elements can improve the fatigue life of very high speed bearings. GRA

N75-22781# Southwest Research Inst., San Antonio, Tex.
DEVELOPMENT OF OPTIMIZATION PROCEDURE FOR DESIGN OF PACKAGE CUSHIONING Final Technical Report, Jun. 1973 - Feb. 1974
Tom D. Dunham, Herbert G. Pennick, Daniel D. Kana, and Andrew Nagy Jan. 1975 212 p refs
(Contract DAAG17-73-C-0239)
(AD-A006645; SWRI-02-3692; USA-NLABS-TR-75-44-AMEL) Avail: NTIS CSCL 13/4

The objective of this project was to develop the computer software for a cushion property and cost optimization procedure for the design selection from available package cushioning materials. The design problem relates to the use of existing cushioning materials to protect large quantity supply items from shock and vibration damage. The approach used in this project was to implement a computer-aided design (CAD) procedure which can be used to select from the available materials data files the material or materials that will protect the item to be shipped for the least cost. The shipping environments were acounted for in terms of shock vibration. The temperature effects on the package cushioning material properties were allowed for in the stored data. Thus, the CAD program optimizes least cost for the materials that will provide the necessary protection. GRA

N75-22782# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
WAVE TRANSMISSIONS AND STRENGTH OF FLEXIBLE WHEELS
V. V. Sheiko 24 Jan. 1975 15 p refs Transl. into ENGLISH from Uch. Zap. Tsentr. Aerogidrodinamicheskii Inst. (USSR), v. 2, no. 1, 1971 p 134-136
(AD-A006730; FTD-MT-24-398-75) Avail: NTIS CSCL 13/6

Wave transmissions and strength of flexible wheels are examined. The possibility of their application and use exists in the aerospace technology. A method of calculation is developed for strength in the flexible wheels of wave transmissions. The results of the calculation satisfactorily agree with the experimental data. Wave transmissions are the new variety of mechanical reducers in which one of the wheels is flexible. GRA

N75-22783# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ERECTING GAS STORAGE FACILITIES AND OIL CENTERS
T. T. Stulov, B. V. Popvskii, and O. M. Ivanov 21 Jan. 1975 518 p refs Transl. into ENGLISH of the monograph "Sooruzhenie Gazokhranilishch i Neftebaz" 1973 p 1-368
(AD-A006559; FTD-HC-23-1722-74) Avail: NTIS CSCL 13/4

This text book sets forth basic information about oil centers and modern methods of constructing steel and concrete tanks for storing petroleum and petroleum products. Problems in designing steel and concrete oil tank members for strength and durability are also discussed. Information is given about the design and construction of gas storage tanks. A separate chapter is devoted to the latest methods of building storage tanks. A detailed description is given on erecting reinforced concrete oil storage tanks as well as underground gas storage tanks. The final chapter covers the machinery which must be used with steel or reinforced concrete storage tanks. GRA

N75-23366 Joint Publications Research Service, Arlington, Va.
USE OF HARD ALLOYS FOR METAL CUTTING AT THE CRAIOVA ELECTROPUTERE
M. Baltanoiu, S. Sontea, C. Chifu, Gh. Rusescu, and T. Combei *In its* Transl. on Eastern Europe: Sci. Affairs, No. 462 (JPRS-64632) 25 Apr. 1975 p 19-26 ref Transl. into ENGLISH from Constructia de Masini (Bucharest), Jan. 1975 p 16-19
(For availability see N75-23363 14-37)

N75-22494 Rolls-Royce, Ltd., Leavesden (England). Small Engine Div.
THE INFLUENCE OF FRETTING ON FATIGUE
W. J. Harris *In* AGARD Specialists Meeting of Fretting in Aircraft Systems Jan. 1975 12 p refs (For availability see N75-22487 14-31)

N75-22497 Dow Corning G. m. b. H., Munich (West Germany).
LUBRICATION UNDER EXTREME PRESSURE [LA LUBRIFICATION EXTREME-PRESSION]
Paul Deyber and Maurice Godet *In* AGARD Specialists Meeting on Fretting in Aircraft Systems Jan. 1975 13 p refs In FRENCH
(For availability see N75-22487 14-31)

N75-22498 Rensselaer Polytechnic Inst., Troy, N.Y. Mechanics Div.
DESIGN OF PIVOTS FOR MINIMUM FRETTING
M. B. Peterson and F. F. Ling *In* AGARD Specialists Meeting on Fretting in Aircraft Systems Jan. 1975 22 p refs (For availability see N75-22487 14-31)

N75-22500* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECT OF VARIOUS MATERIAL PROPERTIES ON THE ADHESIVE STAGE OF FRETTING
Donald H. Buckley *In* AGARD Specialists Meeting on Fretting in Aircraft Systems Jan. 1975 19 p refs (For availability see N75-22487 14-31)

N75-22502 Air Force Materials Lab., Wright-Patterson AFB, Ohio.
FRETTING WEAR BEHAVIOR OF A POLYSILOXANE BONDED SOLID LUBRICANT
R. J. Benzing and B. D. McConnell *In* AGARD Specialists Meeting on Fretting in Aircraft Systems Jan. 1975 6 p refs (For availability see N75-22487 14-31)

N75-22503 Chevron Research Co., Richmond, Calif.
FRETTING WEAR OF STEEL IN LUBRICATING OILS
Douglas Godfrey *In* AGARD Specialist Meeting on Fretting in Aircraft Systems Jan. 1975 7 p refs (For availability see N75-22487 14-31)

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N75-22784*# Rocketdyne, Canoga Park, Calif.
FRACTURE MECHANICS ANALYSIS OF A HIGH-PRESSURE HYDROGEN FACILITY COMPRESSOR Final Report
G. A. Vroman 11 Oct. 1974 34 p
(Contract NAS8-27980)
(NASA-CR-120742; RSS-8597) Avail: NTIS HC $3.75 CSCL 14D

The investigation and analysis of a high-pressure hydrogen facility compressor is chronicled, and a life prediction based on fracture mechanics is presented. Crack growth rates in SA 105 Gr II steel are developed for the condition of sustained loading, using a hypothesis of hydrogen embrittlement associated with plastic zone reverse yielding. The resultant formula is compared with test data obtained from laboratory specimens. Author

N75-22785# Oak Ridge Y-12 Plant, Tenn.
PENETRANT INSPECTION OF WELDS
J. W. Nicely Dec. 1974 7 p refs Presented at Meeting on Inspection of Welds, Knoxville, Tenn., 5 Dec. 1974
(Contract W-7405-eng-26)
(Y-DL-446; Conf-741224-1) Avail: NTIS HC $3.25

Liquid penetrant inspection was probably the earliest nondestructive technique applied in practice. It is unique in that it is almost entirely independent of the geometrical shape of the part to be tested. Penetrant inspection is a sensitive, relatively low cost method for detecting surface discontinuities, and can generally be used on any nonporous metallic or nonmetallic materials. It will reveal cracks of extreme tightness, and inspectors can inspect entire surface of complex shapes in one sequence of operations. Author (NSA)

N75-22786# Nederlands Scheeps-Studiecentrum TNO, Delft. Afdeling Techniek.
MARITIME TRANSPORTATION OF CONTAINERIZED CARGO. PART 5: FIRE TESTS IN A CLOSED ALUMINIUM CONTAINER
H. J. Souer (Tech. Centre for Fire Prevent. TNO) Nov. 1974 17 p refs
(Rept-202-M; TDCK-65874) Avail: NTIS HC $3.25; Ned. Scheepsstudiecentrum TNO, Delft Dfl. 10

Fire tests in closed aluminum containers onboard cargo ships are described. Results indicate theat the risk for ship and remaining cargo, when the cargo of one container catches fire, is rather limited, even when the cargo consists of bottled liquids with a flashpoint sufficiently higher than the ambient temperature. In the latter case, the container should have a special floor construction. The risks are even considerably lower than onboard conventional dry cargo ships. ESRO

N75-22787# University Coll., London (England).
STEPPING MOTOR EXPERIENCE IN SPACE INSTRUMENTATION
T. J. Patrick Paris ESRO 1975 11 p refs Presented at the European Space Tribology Symp., Frascati, Italy, 9-11 Apr. 1975
Avail: NTIS HC $3.25

Continuing performance of an instrument ball bearing in space and simulated space conditions is presented. In X-ray telescopes and other instruments in orbit, some 22 bearings have made up to 10,000 quadrantal steps without lubrication other than that provided by MoS2 particles expressed from the roller cages. Vacuum tests of identical stepper motors demonstrated potential lives well beyond 10 million quadrantal steps. It is assumed that deterioration of stepping systems in space is due to a fall in delivered electrikal power and partly to a very slow increase in ball bearing friction. This deterioration can be held off in design for minimum running friction and limited load inertia. ESRO

N75-22788# General American Transportation Corp., Niles, Ill. Research Div.
NONDESTRUCTIVE INSPECTION OF SHELTER PANELS Final Report, Sep. 1973 - Nov. 1974
Irvin R. Kraska and John J. Wolf Jan. 1975 91 p refs
(Contract F33615-71-C-1552; AF Proj. 2054)
(AD-A007033; AFCEC-TR-75-2) Avail: NTIS CSCL 15/5

This report summarizes the results of an effort to develop equipment and procedures to inspect sandwich panels in air transportable shelters in the field. A rapid and simple-to-operate system has been developed, utilizing a unique eddy sonic technique for metal-faced panels and pitch-catch ultrasonic techniques for non-metal faced panels. The location(s) of debonds and free moisture in the panel are reliably detectable with the system. A prototype model has been successfully field tested. GRA

N75-22789# Army Materiel Command, Texarkana, Tex. Intern Training Center.
DETECTION OF SIMULATED JOURNAL BEARING WEAR USING VIBRATION ANALYSIS Final Report
Joseph David Wu May 1974 84 p refs
(AD-A007142; USAMC-ITC-02-08-73-005) Avail: NTIS CSCL 13/9

The paper examines the sources of vibration in rotating machines. The conversion of machine vibration into an electrical signal by transducers for purposes of measurement and analysis is presented in the first part of the report. These transducers, or vibration pickups, are discussed with regard to their construction and applicability. The second part of this paper investigates the detection of simulated bearing wear in a refrigeration compressor using vibration analysis. For the experiment, connecting-rod bearings in a Dunham-Bush reciprocating compressor were bored oversize to simulate bearing wear. The resulting compressor vibrations picked up by an accelerometer were analyzed to detect changes in the vibration signal. The power spectral density of the vibration signal was computed. The results indicate that an increase in the connecting-rod bearing clearances is detectable in the power spectral density plot of the accelerometer output. GRA

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance*.

N75-22790 Massachusetts Univ., Amherst.
VIBRATIONS OF ORTHOTROPIC CIRCULAR PLATES WITH IN-PLANE LOADING Ph.D. Thesis
Alexander S. W. Chuang 1974 111 p
Avail: Univ. Microfilms Order No. 75-6003

The governing differential equation for the vibration of orthotropic circular plates under in-plane loading is presented. The method of finite difference is used for its solution. Numerical comparisons between existing theories are provided for both simply supported and fixed-end supported cases for symmetric modes. Neglecting the effect of in-plane loading results obtained by the finite difference method are compared to theoretical and experimental results provided for a simply supported orthotropic circular plate in a previous investigation. Computations to determine frequencies and nodal patterns were programmed in FORTRAN 2 language and carried out on a CDC 3600 computer. Dissert. Abstr.

N75-22791 California Univ., Los Angeles.
MECHANICS OF ADHESIVE JOINTS WITH A THIN ADHESIVE LAYER Ph.D. Thesis
Bijan Farhad 1974 121 p
Avail: Univ. Microfilms Order No. 75-5705

The effect of an adhesive layer on the stress field of an adhesive joint under cleavage and tension-shear loading was investigated on the basis of classical two dimensional theory of elasticity, taking the presence of the thin adhesive layer into account. The cleavage problem of a lap joint, the so-called double cantilever problem, was reduced to a Fredholm integral equation of the second kind, while the tension-shear problem was reduced to a pair of Fredholm integral equations. In the analysis the mode of fracture is assumed to be cohesive fracture within the adhesive layer. Numerical results are presented for the distribution of normalized bond stresses and stress intensity factors at the crack tip within the adhesive layer with particular emphasis on their dependence on the ratios of Young's moduli and thicknesses, of the adhesive to the adherend. Dissert. Abstr.

N75-22792 Massachusetts Univ., Amherst.
DAMPING OF METAL-METAL COMPOSITES WITH ELASTIC MATRIXES AND ELASTIC-PLASTIC INCLUSIONS Ph.D. Thesis
Marshall Gordon Jones 1974 116 p
Avail: Univ. Microfilms Order No. 75-6042

Data are given on: (1) an experimental procedure for the measurement of composite and plastic damping for metal--metal composites, (2) a procedure for fabricating composites, (3) development of a theoretical means to predict plastic damping and (4) a comparison of measured and predicted plastic damping. The apparatus used tested composites in a quasi-static compression-unloading cycle. The dissipated to strain energy ratio which is proportional to a damping measure can be determined by this experimental procedure. The metal-metal composites were fabricated from elastic matrix materials which were combined with low yield stress plastically determable inclusions. A rheological model was used in the development of a bilinear hysteresis loop. From this loop and the derived composite modulus, theoretical plastic damping values could be determined for metal-metal composites. Plastic strain was the damping mechanism studied and the resulting energy loss was measured and compared with predicted values. Dissert. Abstr.

N75-22793 Delaware Univ., Newark.
NONLINEAR DEFLECTIONS AND LARGE AMPLITUDE OSCILLATIONS OF THIN PLATES AND SHALLOW SHELLS MADE OF CERTAIN SPECIAL MATERIALS Ph.D. Thesis
Hisaichi Ohnabe 1975 616 p
Avail: Univ. Microfilms Order No. 75-6390

An examination was made of shallow shell reactions with nonlinear vibrations of orthotropic sandwich type plates, large deflections of poroelastic plates under sudden application of constant load, and large deflections of physically nonlinear plates. Berger's method of evaluation of large deflections of elastic plates and certain inconsistencies of the method are discussed.
Dissert. Abstr.

N75-22794 Massachusetts Univ., Amherst.
INFLUENCE OF SHEAR ON NON-LINEAR BEHAVIOR OF AN ORTHOTROPIC THIN SHALLOW RECTANGULAR PANEL Ph.D. Thesis
Pei-Kao Hsueh 1974 113 p
Avail: Univ. Microfilms Order No. 75-6039

Using the energy method and calculus variational theorem, a set of the governing force equilibrium differential equations as well as the required natural boundary conditions for an orthotropic shallow rectangular panel in the nonlinear large deflection range with the consideration of transverse shear deformation effects were derived. Emphasis was given to the application of the procedures developed to different load and support conditions for given shallow shell geometries. Snap through buckling loads for spherical panels with a rectangular plan form base were computed for a wide range of shell geometries for both isotropic and orthotropic materials. Snap through buckling loads for cylindrical panels are also demonstrated to show the broad capability of the computer program. Dissert. Abstr.

N75-22795 Princeton Univ., N.J.
ANALYSIS OF COMPLEX ELASTIC STRUCTURES BY A RAYLEIGH-RITZ COMPONENT MODES METHOD USING LAGRANGE MULTIPLIERS Ph.D. Thesis
Larisse Rosentweig Klein 1974 287 p
Avail: Univ. Microfilms Order No. 75-6649

The free vibrations of elastic structures of arbitrary complexity are analyzed in terms of their component modes. The method is based upon the use of the normal unconstrained modes of the components in a Rayleigh-Ritz analysis. The continuity conditions are enforced by means of Lagrange Multipliers. Examples of the structures considered are: beams with nonuniform properties, airplane structures with high or low aspect ratio lifting surface components, the oblique wing airplane, and plate structures. The method is also applied to the analysis of modal damping of linear elastic structures. Convergence of the method versus the number of modes per component and/or the number of components is discussed; the method is compared to more conventional approaches, to ad hoc methods for some examples, and to experimental results. Dissert. Abstr.

N75-22796 Missouri Univ., Columbia.
A STUDY OF LOAD-DEFORMATION AND BUCKLING RELATIONSHIPS FOR RETICULATED SHELLS Ph.D. Thesis
Harvey Dean Bartel 1974 241 p
Avail: Univ. Microfilms Order No. 75-5725

The load deformation response of reticulated shells, and the validity of several current buckling theories as applied to this type of structure were investigated. The growth of imperfections in reticulated shell models was also addressed. Two types of theoretical analyses of reticulated shells were conducted to predict load-deformation relationships. A split rigidity concept was used to determine equivalent membrane and bending thicknesses. Equivalent meant a shell thickness equal to that of a continuous shell responding similarly in membrane and bending action. Elastic material behavior was assumed. The second technique was an elastic space frame analysis using the NASTRAN computer code. This approach was characterized by loading the shell incrementally and assuming the deflected geometry at each load increment to provide the initial conditions for subsequent loadings.
Dissert. Abstr.

N75-22797 Carnegie-Mellon Univ., Pittsburgh, Pa.
A CONTINUUM THEORY OF ELASTIC MATERIAL SURFACES Ph.D. Thesis
Alexander Ian Murdoch 1975 80 p
Avail: Univ. Microfilms Order No. 75-5529

A mathematical framework employing direct notation is developed for the study of the mechanical behavior of material surfaces. The tensorial nature of surface stress is established using the force and moment balance laws. Bodies whose boundaries are material surfaces are discussed and the relationship between surface and body stress examined. Elastic surfaces are defined and a linear theory with nonvanishing residual stress derived. The free-surface problem is posed within the linear theory and uniqueness of solution demonstrated. Predictions of the linear theory are noted and compared with the corresponding classical results. A note on frame-indifference and symmetry for material surfaces is included. Dissert. Abstr.

N75-22798 Cornell Univ., Ithaca, N.Y.
EQUILIBRIUM STATES ON THIN ENERGY SHELLS Ph.D. Thesis
Richard Leslie Thompson 1974 115 p

Avail: Univ. Microfilms Order No. 75-6752

The probability measures on configurations of particles in a finite lattice obtained by restricting the grand canonical ensemble to an energy shell, or set of particle configurations which share a common total energy with respect to a vector of potentials are considered. The set of weak limits of these measures as the finite lattice expands to Z(eta) is used to define a class of translation invariant states on Z(eta). This class is convex and it is shown that the extreme points of the class are Gibb's states. The thermodynamic limit for the partial pressure function as the finite lattice tends to Z(eta) is studied and shown to be a Legendre transformation of the classical pressure function. It is shown that a Markovian time evolution model for a lattice gas exhibits condensation of liquid droplets from an initially gaseous phase. Translation invariant Markov random fields and Markov chains are studied. Ergodic Markov random fields are shown to be characterized by their property of invariance with respect to a certain group, G. Markov chains are given a global characterization and are shown to be limits as n approaches limit of infinity of states on strips of length n which give equal weight to all configurations of particles of a certain total energy within the strip and zero to other configurations. Dissert. Abstr.

N75-22799 California Univ., Los Angeles.
ANALYSIS OF PLANE WAVES IN INFINITE, LAMINATED, PIEZOELECTRIC PLATES Ph.D. Thesis
Kenneth Eugene Pauley 1974 146 p
Avail: Univ. Microfilms Order No. 75-9426

A finite element analysis is presented for predicting free-vibration characteristics in infinite, laminated piezoelectric plates under a condition of plane strain. The plates considered may be composed of an arbitary number of perfectly bonded layers where each layer, or laminate, may have a triclinic description of elastic, piezoelectric, and dielectric properties. Assumptions were made for waveforms for both the particle displacements and the electrostatic scalar potential. Exact functional forms were chosen along the propagating direction, and approximate interpolating functions were taken over thin mathematical regions (laminae) representing behavior in the plate's thickness direction. The electromechanical version of Hamilton's principle was used to generate mass and piezoelectric stiffness matrices for selected laminae in terms of discrete or generalized coordinates. Assembly of the individual lamina matrices leads to an algebraic eigenvalue problem for the laminated composite. Dissert. Abstr.

N75-22800 California Univ., Los Angeles.
AN INTEGRAL EQUATION METHOD FOR STRESS ANALYSIS OF ANISOTROPIC ELASTIC MEDIA Ph.D. Thesis
Kyu Jong Lee 1974 73 p
Avail: Univ. Microfilms Order No. 75-9409

The linear, traction boundary value problem of the anisotropic solid is considered. The elastic body occupies a two-dimensional region of arbitrary shape and connectivity, and the plane of elastic symmetry at each point coincides with the plane of the body. The boundary loadings are continuous and are applied statically. The general problem is reduced to a system of singular integral equations with Cauchy kernels by means of the classical stress function approach. The unknowns are certain complex valued functions which may be interpreted as virtual forces acting on the boundary, and the integral equations are represented over the image in the boundary in the complex plane. The free terms in the equations are the applied loads. A numerical scheme was developed for the solution of the integral equations. The boundary curve is discretized and suitable polynomial approximations of the unknown functions in terms of the complex variable are introduced. Dissert. Abstr.

N75-22801 Virginia Polytechnic Inst. and State Univ., Blacksburg.
A STUDY IN ELASTIC VISCOELASTIC PLASTICITY OF A CIRCULAR BAR UNDER TORSION Ph.D. Thesis
Justo R. Marquez M. 1975 215 p
Avail: Univ. Microfilms Order No. 75-7560

A numerical method for the theoretical solution of the creep problem under constant torque of a circular cylinder made of an elastic-viscoelastic-plastic materials is derived. The use of representative experimental data for polycarbonate allows the determination of a complete numerical solution. A coordinate system was established which permits the determination of the values for such meaningful quantities as stress, strain, yield function, deformation angle, etc., at every point in the cylinder and at any time. This is done by means of a successive approximation procedure, which uses the constitutive elastic, viscoelastic, and plastic relations defined by the Brinson mechanical model. It is shown that a circular cylinder made of an elastic-viscoelastic-plastic material may behave as a Hookean solid, or a viscoelastic fluid depending on the magnitude of the applied constant torque. Dissert. Abstr.

N75-22802 Polish Academy of Sciences, Warsaw.
CONTINUUM MODEL OF A MEDIUM WITH REBUILT STRUCTURE (APPLICATION TO A DESCRIPTION OF ROCKS AND CONCRETES) [KONTYNUALNY MODEL OSRODKA Z PARAMETREM PRZEBUDOWY STRUKTURY (ZASTOSOWANIE DO OPISU SKAL I BETONOW)]
Andrzej Dragon 1974 54 p refs In POLISH
Avail: Issuing Activity

Problems of describing materials (such as steels, structural concrete, ceramics), whose conservation is strongly determined through brittleness effects, were examined. Elastic and inelastic compression and crack formation in these materials were also investigated along with a mathematical model for solving boundary value problems. Other topics discussed include dilatation theories of plasticity with parameters controlling structural changes, mechanical failure, hydrostatic pressure, wear characteristics, stress-strain diagrams, fracture mechanics, creep properties, and elastic-plastic deformation. Transl. by M.J.S.

N75-22803 University of Southern Calif., Los Angeles.
DISSIPATION OF END LOADING IN THICK CYLINDRICAL SHELLS Ph.D. Thesis
Jamshid Pajuhesh 1974 118 p
Avail: Univ. Microfilms Order No. 75-6435

The type of solution is sought which has a sinusoidal variation in the circumferential direction and in the longitudinal direction decays exponentially with or without oscillations. Two solutions are obtained using the theory of elasticity. In the first formulation, Papkovich functions are employed to solve the equations of elasticity in the cylindrical coordinates. In the second approach, the Cartesian equations of elasticity are solved for the cylindrical coordinates by a change of variables technique. The two solutions are checked against each other. In the above solutions, the condition that the inner and outer surfaces are free of stresses yields at transcendental equation for values of the dissipation parameter. Associated with each value of the parameter is a set of stress distribution across the shell thickness. The solution of the transcendental equation is very demanding on computer time since it is a nonlinear complex-valued nonsymmetric eigenvalue problem requiring double-precision arithmetic as well. Dissert. Abstr.

N75-22804 Wisconsin Univ., Madison.
VIBRATIONS OF SPINNING CIRCULAR SANDWICH PLATES Ph.D. Thesis
Vastupal Babubhai Shah 1974 129 p
Avail: Univ. Microfilms Order No. 75-5958

A general theory was developed to study the axisymmetric and nonaxisymmetric flexural vibrations of spinning circular sandwich plates. The plate considered was symmetrically arranged with respect to the middle plane of the sandwich, and rested on an elastic foundation of spring constant k with uniformly distributed radial edge loads. The theory includes the effects of transverse shear deformation and rotary inertia in all three layers of the plate. The equations of motion are derived by applying the Newton's Second Law to an element of the sandwich and by Hamilton's principle. Assuming that there is no slipping at the interfaces between the core and the faces of the sandwich, a system of five simultaneous linear partial differential equations in five displacement components was obtained. A numerical scheme was used to solve the problem, and by separation of variables, the equations were reduced to a system of ordinary differential equations. A finite difference technique using the central difference method further reduced these equations to a set of algebraic equations which were rearranged to obtain an eigenvalue problem. The eigenvalues for axisymmetric and nonaxisymmetric vibrations were computed on a digital computer for various boundary conditions. Dissert. Abstr.

N75-22805 Texas Technological Univ., Lubbock.
ANALYSIS OF DOUBLY CORRUGATED SHELL STRUCTURES BY THE FINITE ELEMENT METHOD Ph.D. Thesis
Herbert Anton Mang 1974 267 p
Avail: Univ. Microfilms Order No. 75-7420

A technique was investigated for the analysis of cylindrical, doubly corrugated shell structures. The shells consist of adjacent U-shaped arch-ribs which are bolted together to form the large corrugations of the structure. Each arch-rib is made up of several panels bolted together, and small corrugations are rolled into the lower portion of the panels to obtain the proper curvature. The linear elastic, static, and dynamic analyses considered the actual geometry of the cross section of the arch-ribs, which is believed to be a new approach, permitting a better understanding of local deformations. The finite element model consists of an assemblage of rectangular, doubly and singly curved finite elements with 48 degrees of freedom per element. Products of Hermitian interpolation polynomials were used as shape functions. Structural anisotropy, caused by the small corrugations, is treated as material anisotropy. Computer programs were developed for the static and dynamic analyses. Dissert. Abstr.

N75-22806 Illinois Univ., Urbana.
WAVE PROPAGATION IN AN ELASTIC HALF SPACE DUE TO COUPLES APPLIED AT A POINT BENEATH THE SURFACE Ph.D. Thesis
Thomas Eugene Farewell 1974 187 p
Avail: Univ. Microfilms Order No. 75-11608

The disturbances that result from application of dynamic couples at a point beneath the surface of an elastic half space are determined. This problem provides a basis for earthquake modeling. The disturbances from couple sources simulate the elastic motion following a fault dislocation and occurring in the presence of an initial strain state. An efficient approach for determining the disturbances for any model is provided by superposition of five fundamental double force cases.
Dissert. Abstr.

N75-22807 Ohio State Univ., Columbus.
MODAL ANALYSIS OF LINEAR NONCONSERVATIVE SYSTEMS Ph.D. Thesis
Richard Lowell Adkins 1974 165 p
Avail: Univ. Microfilms Order No. 75-11301

Modal methods for analyzing continuous, linear, nonconservative vibrating systems are developed and applied. Both viscous and hysteretic damping are considered and the damping distributions are arbitrary such that the normal modes of the corresponding undamped system will not uncouple the equations of motion of the nonconservative or damped system. Analytical and graphical results are presented for the special case of a pinned-pinned beam with a viscous or hysteretic damping unit at the center of the beam. These results show the uncoupled vibration modes, and the amplitude and phase variation along the beam for uniform harmonic forcing. The results of this investigation are contrasted to the modal methods for conservative systems and it is recommended that nonconservative systems be considered the general vibration problem. Dissert. Abstr.

N75-22808# Pisa Univ. (Italy). Ist. di Meccanica Applicata e Costruzioni di Macchine.
A METHOD FOR DETERMINING THE FREQUENCY AND PROPER MODE OF VIBRATION TRANSVERSE A RETICLE PLANE [UN METODO PER LA DETERMINAZIONE DELLE FREQUENZE E DEI MODI PROPRI DI VIBRAZIONE TRASVERSALI DI TRAVATURE RETICOLARI PIANE]
G. Cavallini 1972 52 p refs In ITALIAN
(Rept-34) Avail: NTIS HC $4.25

The fundamental equations for resolving the frequency and vibrational mode of a structural beam are developed and examples of their use are given. Topics discussed include: analysis of the deformation mode, kinetic and potential elasticity, and application of the Hamilton principle. Transl. by F.O.S.

N75-22809# Pisa Univ. (Italy). Ist. di Meccanica Applicata e Costruzioni di Macchine.
EXPERIMENTAL ANALYSIS WITH EXTENSOMETRIC TECHNIQUES FOR THE STRESS STATE OF THE MOUTH AND THE DEEP ZONE OF CURVATURE IN PRESSURIZED VESSELS [ANALISI SPERIMENTALE CON TECNICHE ESTENSIMETRICHE DELLO STATO DI SOLLECITAZIONE IN CORRISPONDENZA DEL BOCCHELLO E DELLA ZONA DI RACCORDO DEL FONDO DI UN RECIPIENTE IN PRESSIONE]
Paolo Citti and Sergio Reale 1974 39 p refs In ITALIAN
(Rept-36) Avail: NTIS HC $3.75

The results are reported of 22 explosion tests of cylindrical models of nickel-steel at cryogenic temperatures. The models had axial cracks passing through the wall. By slowly increasing the pressure, the pressure for crack initiation was determined.
Transl. by F.O.S.

N75-22810*# Toronto Univ. (Ontario). Inst. for Aerospace Studies.
EXPERIMENTAL EVALUATION OF THE TENSOR POLYNOMIAL FAILURE CRITERION FOR THE DESIGN OF COMPOSITE STRUCTURES Progress Report
R. C. Tennyson Mar. 1975 82 p refs
(Grants NGR-52-026-039; NRC-A-2783)
(NASA-CR-142701) Avail: NTIS HC $4.75 CSCL 20K

The experimental measures and techniques are described which are used to obtain the strength tensor components, including cubic terms. Based on a considerable number of biaxial pressure tests together with specimens subjected to a constant torque and internal pressure, a modified form of the plane stress tensor polynomial failure equation was obtained that was capable of predicting ultimate strength results well. Preliminary data were obtained to determine the effect of varying post cure times and ambient temperatures (-80 F to 250 F) on the change in two tensor strength terms, F sub 2 and F sub 22. Other laminate configurations yield corresponding variations for the remaining strength parameters. M.J.S.

N75-22811*# California Univ., Los Angeles. School of Engineering and Applied Science.
THE MOTION OF INTERCONNECTED FLEXIBLE BODIES Final Report
Arthur Stewart Hopkins Feb. 1975 233 p refs
(Contract NAS8-28358)
(NASA-CR-120740; UCLA-ENG-7513-Vol-3) Avail: NTIS HC $7.50 CSCL 20K

The equations of motion for an arbitrarily interconnected collection of substructures are derived. The substructures are elastic bodies which may be idealized as finite element assemblies and are subject to small deformations relative to a nominal state. Interconnections between the elastic substructures permit large relative translations and rotations between substructures, governed by Pfaffian constraints describing the connections. Screw connections (permitting rotation about and translation along a single axis) eliminate constraint forces and incorporate modal coupling. The problem of flexible spacecraft simulation is discussed. Hurty's component mode approach is extended by permitting interconnected elastic substructures large motions relative to each other and relative to inertial space. The hybrid coordinate methods are generalized by permitting all substructures to be flexible (rather than only the terminal members of a topological tree of substructures). The basic relationships of continuum mechanics are developed. Author

N75-22812# Toronto Univ. (Ontario). Inst. for Aerospace Studies.
LABORATORY SIMULATION OF AN AIR-CURTAIN ROOF FOR THE ONTARIO SCIENCE CENTRE
A. A. Haasz, B. Etkin, R. T. Lake, and P. L. E. Goering Feb. 1975 26 p refs
(Grant NRC-A-1894)
(UTIAS-TN-192) Avail: NTIS HC $3.75

A laboratory simulation with a scaled-down model of the Ontario Science Center was performed in order to study the effectiveness of an air-curtain roof in preventing rain and snow from entering the courtyard at the center. Precipitation was simulated with solid glass beads of 53-74 microns nominal diameter range. In order to optimize the protection feature of the air-curtain, a variety of jet configurations were investigated. The determination of power requirements and other jet parameters as functions of the impinging precipitation penetrating the air-curtain roof was necessary before a full-scale implementation

could be considered. For the co-flowing and counter-flowing wind directions, configurations were arrived at that would require about 600 HP in the jet to eliminate 90 percent of the simulated rain; these configurations are not considered optimum and a reduction in the power requirements is anticipated. Author

N75-22813*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
STRESS CONCENTRATION FACTORS FOR CIRCULAR, REINFORCED PENETRATIONS IN PRESSURIZED CYLINDRICAL SHELLS Ph.D. Thesis - Virginia Univ.
James W. Ramsey, Jr. May 1975 205 p refs
(NASA-TM-X-68733) Avail: NTIS HC $7.25 CSCL 20K

The effect on stresses in a cylindrical shell with a circular penetration subject to internal pressure was investigated in thin, shallow linearly, elastic cylindrical shells. Results provide numerical predictions of peak stress concentration factors around nonreinforced and reinforced penetrations in pressurized cylindrical shells. Analytical results were correlated with published formulas, as well as theoretical and experimental results. An accuracy study was made of the finite element program for each of the configurations considered important in pressure vessel technology. A formula is developed to predict the peak stress concentration factor for analysis and/or design in conjunction with the ASME Boiler and Pressure Vessel Code. Author

N75-22814# Pisa Univ. (Italy). Ist. Di Aeronautica.
THE EFFECT OF RIVETED RIGIDITY ON THE INTENSITY FACTOR OF A FORCE IN THE PLANE OF A CRACK IN A SHEET [L'EFFETTO DI IRRIGIDIMENTI RIVETTATI SUL FATTORE DI INTENSITA DELLO SFORZO IN UNA LAMIERA PIANA TESA FESSURATA]
A. DelPuglia 1973 84 p refs In ITALIAN
(Rept-40) Avail: NTIS HC $4.75

The effects are resolved for a large range of configurations with the active stiffening arranged symmetrically and nonsymmetrically with respect to the axis of the crack. The results are reported in the form of correction coefficients (for the factor of load intensity with and without stiffening) and the overload factor for each rigidity. Transl. by F.O.S.

N75-22815# Pisa Univ. (Italy).
EXPERIMENTAL RESEARCH ON COLLAPSE LOADS AND PHENOMENA FOR THE PLASTIC ASSESSMENT OF A STEEL PIPELINE [RICERCA SPERIMENTALE SUI CARICHI DI COLLASSO E SUI FENOMENI DI ASSESTAMENTO PLASTICO DI UNA TUBAZIONE IN ACCIAIO]
G. Nerli and P. Citti 1974 14 p refs In ITALIAN; ENGLISH summary Sponsored by CNR
(Rept-43) Avail: NTIS HC $3.25

Tests are described of the collapse load and plastic yielding of Fe 45 carbon steel pipes, loaded at two branching connections. Proportional loading until collapse were performed. Tests with cyclic loading causing incremental collapse were also performed. The results are compared with those of simplified theories. Author

N75-22816# Pisa Univ. (Italy).
ON THE RESOLUTION OF NONLINEAR ELASTIC AND ELASTOPLASTIC PROBLEMS BY THE METHOD OF FINITE ELEMENTS [SULLA RISOLUZIONE DEI PROBLEMI DI ELASTICITA NON LINEARE E DI ELASTO-PLASTICITA ATTRAVERSO IL METODO DEGLI ELEMENTI FINITI]
C. Carmignani, A. Cella (CNR, Pisa, Italy), and A. DePaulis 1974 14 p refs In ITALIAN; ENGLISH summary
(Rept-39) Avail: NTIS HC $3.25

The computational procedures on nonlinear solid mechanics which are differentiated primarly by the type of nonlinearity are discussed in terms of geometric and material nonlinearity. Iterative algorithms were analyzed. These include: functional iteration, relaxation, and the alpha method. The algorithms were tested on problems including simple trusses and frames, and plates and membranes partitioned into finite elements. Author

N75-22817*# Universal Analytics, Inc., Los Angeles, Calif.
NASTRAN USER'S GUIDE: LEVEL 15
Washington NASA Apr. 1975 226 p
(Contract NAS1-6024)
(NASA-CR-2504) Avail: NTIS HC $7.50 CSCL 20K

The NASTRAN structural analysis system is presented. This user's guide is an essential addition to the original four NASTRAN manuals. Clear, brief descriptions of capabilities with example input are included, with references to the location of more complete information. Author

N75-22818# Aeronautical Research Inst. of Sweden, Stockholm.
DETERMINATION OF BUCKLING AND ULTIMATE LOADS FOR CURVED PANELS SUBJECTED TO SHEAR LOADING
Vl Gamziukas 1974 44 p refs
(FFA-HU-1624) Avail: NTIS Hc $3.75

Static shear tests were conducted at room temperature with curved panels to determine the buckling and ultimate shear loads for curved panels of different thicknesses and with different dimensions of the panel fields. The panels were shaped as web-beams, where the curved webs constituted the panels. The panel was reinforced by two spars, two end profiles, four rings, and two stringers all riveted to the panel. The dimensions of the three middle fields were identical for one and the same panel. One and the same cross section area of the spars but different areas of rings and stringers were used in the panels. The material of the panel plate was aluminum 3526-38 and -68, and of the profiles 3526-6 according to the Saab-Scania notation. The relationship between the shear load and the total and permanent shear deformations, the buckling and ultimate shear loads were determined. The distribution of shear stresses along the panel plate was measured only for one panel. Author

N75-22819# Tokyo Univ. (Japan). Inst. of Space and Aeronautical Science.
DYNAMIC BEHAVIOR OF VISCOELASTIC SHALLOW SPHERICAL SHELLS, VOLUME 40, NUMBER 1
Megumi Sunakawa and Nori Kumai Jan. 1975 32 p refs
(ISAS-521-Vol-40-No-1) Avail: NTIS HC $3.75

On the basis of nonlinear theory, the axisymmetric dynamic behavior of viscoelastic shallow spherical shells is analyzed. Step and graded loadings, are considered and a linear model is used to describe the viscoelastic characteristics of materials. The governing equations are solved numerically, and the critical load and the effects of viscoelasticity and loading speed on the dynamic behavior are discussed. It is shown that buckling phenomena must be analyzed paying attention to the role of time, since dynamic, static and creep bucklings are related with one another as a function of time. A clear definition of dynamic buckling is proposed. Theoretical predictions show a good agreement with experimental results. From the results, the quasi-static buckling load is also obtained immediately. Author

N75-22820# Aeronautical Research Labs., Melbourne (Australia).
FATIGUE OF STEEL STRUCTURES AND STRUCTURAL STEEL
J. Y. Mann Mar. 1974 34 p refs
(ARL/SM-348) Avail: NTIS HC $3.95

The source and nature of fatigue loadings which can be experienced by structures are discussed along with some basic concepts relating to the fatigue of steels, leading to fracture mechanics concepts in fatigue crack propagation. Reference is made to the fatigue design requirements in various codes and specifications and, in particular, to the behavior of various types of welded and bolted joints under fatigue loading conditions. It is shown that, when relatively long fatigue lives are involved, the fatigue performance of a structure is dependent primarily on the detail design and configuration of the joints incorporated in its manufacture; the steels actually selected for the product have only a secondary influence on its behavior under repeated loads. In the case of low-cycle fatigue, or under conditions of high static mean stress, the choice of a high static tensile steel may be well justified. A check-list is provided of 'rules' which provide a basis for good fatigue-design practice. Author

N75-22821# Nederlands Scheeps-Studiecentrum TNO, Delft. Scheepsbouw Afdeling.
HULL RESONANCE NO EXPLANATION OF EXCESSIVE VIBRATIONS
S. Hylarides (Neth. Ship Model Basin) Mar. 1974 17 p refs
(Rept-192-S; TDCK-65206) Avail: NTIS HC $3.25; Ned. Scheepsstudiecentrum TNO, Delft Dfl. 10

An approach to marine vibration problems is given, showing that for modern, high-powered ships excessive hull vibrations at service rpm cannot be explained by hull resonances. The fundamental cause is the increased power. The solution of present-day vibration problems must be found in reducing the excitation forces, strongly dominated by propeller cavitation and propeller shaft resonances. Calculation of hull vibrations is only required to know the final response level in order to detect unpleasant or dangerous vibrations, and it is no longer necessary to know the higher node hull resonances in order to avoid their excitation at service speed. Author (ESRO)

N75-22822# Nederlands Scheeps-Studiecentrum TNO, Delft. Scheepsbouw Afdeling.

NUMERICAL HULL VIBRATION ANALYSIS OF A FAR EAST CONTAINER SHIP

P. Meijers (Inst. TNO for Mech. Construct.) Jul. 1974 28 p refs

(Rept-195-S; TDCK-65495) Avail: NTIS HC $3.75; Ned. Scheepsstudiecentrum TNO, Delft Dfl. 10

A finite element analysis is presented to determine the added mass matrix of an arbitrary three-dimensional structure vibrating in liquid. The corresponding computer program was coupled with the ASKA general purpose finite element program to obtain the stiffness-matrix of the elastic structure. Subsequently, an eigenvalue and response analysis may be performed with a package of subroutines for dynamic analysis. The procedure was applied to determine the lower natural frequencies and the symmetric and antisymmetric vibration modes of the Nedlloyd Far East container ships. Author (ESRO)

N75-22823# Nederlands Scheeps-Studiecentrum TNO, Delft. Afdeling Techniek.

TRANSVERSE VIBRATIONS OF SHIP'S PROPULSION SYSTEM. PART 1: THEORETICAL ANALYSIS

S. Hylarides (Neth. Ship Model Basin) Oct. 1974 20 p refs (Rept-197-M; TDCK-65871) Avail: NTIS HC $3.25; Ned. Scheepsstudiecentrum TNO, Delft Dfl. 10

A calculation method for estimating the resonance frequencies of the propeller shaft system of a ship, based on the finite element method, was developed. The method was applied to the shafting of the third generation containerships owned by a Netherlands shipping union. The results of the calculations and those of the measurements on the nonrotating shaft show an acceptable agreement. ESRO

N75-22824# Nederlands Scheeps-Studiecentrum TNO, Delft. Afdeling Techniek.

TRANSVERSE VIBRATIONS OF SHIP'S PROPULSION SYSTEMS. PART 2: EXPERIMENTAL ANALYSIS

L J. Wevers (Inst. TNO for Mech. Construct.) Dec. 1974 20 p refs

(Rept-203-M; TDCK-65875) Avail: NTIS HC $3.25; Ned. Scheepsstudiecentrum TNO, Delft Dfl. 10

A calculation method, developed for estimating the resonance frequencies of the propeller shaft system of a ship, was tested. Impact excitation was measured on the nonrotating shaft with the ship in dry dock and with the ship afloat, and propeller excitation was also measured with the ship in operating conditions. ESRO

N75-22825# National Bureau of Standards, Washington, D.C. D. C. Center for Building Technology.

INTERNATIONAL ACTIVITIES FOR 1973, CENTER FOR BUILDING TECHNOLOGY Final Report, Jan. - Dec. 1973

Charles C. Raley Jul. 1974 55 p

(COM-75-10102/2; NBSIR-74-514) Avail: NTIS HC $4.25 CSCL 13M

The Center for Building Technology's 1973 international activities are summarized including formal cooperative programs, exchange programs, special projects, international organization memberships, foreign guests at CBT, and CBT foreign travel. GRA

N75-22826# Massachusetts Inst. of Tech., Cambridge. Aeroelastic and Structures Research Lab.

PETROS 3.5: NEW DEVELOPMENTS AND PROGRAM MANUAL FOR THE FINITE-DIFFERENCE CALCULATION OF LARGE ELASTIC-PLASTIC TRANSIENT DEFORMATIONS OF MULTILAYER VARIABLE-THICKNESS SHELLS Final Report

S. Denny Pirotin, Barbara A. Berg, and Emmett A. Whitmer Feb. 1975 396 p refs

(Contract DAAD05-68-C-0314)

(AD-A007215; ASRL-TR-152-4; BRL-CR-211) Avail: NTIS CSCL 20/11

The governing equations for the arbitrarily-large-deformation elastic-plastic transient responses of variable-thickness, hard-bonded, multilayer, multi-material, thin, Kirchhoff shells of any initial shape are presented and solved by the finite-difference technique; two types of spatial finite-difference grids are available. The material is assumed to be initially isotropic and to exhibit elastic, strain-hardening, strain-rate-sensitive, and temperature-dependent behavior. The structure may be subjected to a variety of initial velocity distributions, transient mechanical loads, and/or transient thermal loads. These capabilities and features are contained in a computer program PETROS 3.5 which has been applied to a variety of example problems; this computer code provides improvements over previous PETROS codes with respect to the spatial finite-difference grid, improved and additional boundary conditions, improved pole treatment, and more user-oriented options. GRA

N75-22827# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

DEVELOPMENT OF FATIGUE CRACKS UNDER VACUUM CONDITIONS

B. I. Ermolenko 15 Jan. 1975 23 p refs Transl. into ENGLISH from Uch. Zap., Tsent., Aerogidrodinamicheskii Inst. (USSR), v. 4, no. 1, 1973 p 71-76

(AD-A007187; FTD-MT-24-0289-75) Avail: NTIS CSCL 11/6

The fatigue failure of structural alloys and pure metals was investigated under conditions of vacuum. The following factors were considered: formation of microcracks in air and in vacuum, and the effects of oxidation on the formation of macrocracks. Retardation of the development of cracks in vacuum was explained, based on the effect of cold welding in vacuum. J.M.S.

N75-22828# Bell Aerospace Co., Buffalo, N.Y.

OPTIM 2: A MAGIC COMPATIBLE LARGE-SCALE AUTOMATED MINIMUM WEIGHT DESIGN PROGRAM. VOLUME 1: ENGINEERS AND USERS MANUAL Final Report, Jun. 1972 - Apr. 1974

R. A. Gellatly, D. M. Dupree, and L. Berke Jul. 1974 146 p refs

(Contract F33615-72-C-1351; AF Proj. 1467)

(AD-A006747; D2459-950001; AFFDL-TR-74-97-Vol-1) Avail: NTIS CSCL 13/13

A pilot computer program OPTIM was developed previously for the weight optimization of complex finite element models of real structures subject to strength and stiffness constraints. The program was developed using optimality criteria to generate a highly efficient iterative optimization procedure with good convergence characteristics which are independent of problem size. In the present study, the pilot program is expanded both in capacity and scope to a new version OPTIM 2 which is compatible with the MAGIC finite element analysis system. The finite element library is expanded by the addition of five new elements and a number of special computational features are provided to extend the utility of the program. The input/output is compatible with MAGIC but OPTIM 2 can be used as a stand-alone analysis program. The report presents a complete development of the theoretical basis for stiffness-based optimality criteria along with description of the program features. GRA

N75-22829# Army Tank-Automotive Command, Warren, Mich.

REFERENCE RADIOGRAPHS FOR FULL PENETRATION ALUMINUM WELDMENTS

Melvin V. Pyhtila and Walter F. Wulf Jun. 1974 67 p

(AD-A007252; TACOM-TR-11891) Avail: NTIS CSCL 13/5

Standard reference radiographs were selected from weld flaw specimens fabricated from aluminum plate of various thicknesses to establish a military document containing reference radiographs for quality control of full penetration aluminum weldments. The various types of flaws known to occur in full penetration

aluminum welds were prepared with production reproducible welding procedures, and were radiographically graded according to pre-established severity levels. GRA

N75-22830# Materials Research Lab., Inc., Glenwood, Ill.
FRACTURING CHARACTERISTICS OF ADHESIVE JOINTS Final Report, 1 Jan. 1973 - 31 Jan. 1974
Sheldon Mostovoy and E. J. Ripling Oct. 1974 82 p refs
(Contract N00019-73-C-0163)
(AD-A001335) Avail: NTIS CSCL 13/5

The report describes the fracturing parameters of a series of experimental and commercial adhesives using fracture mechanics techniques. The toughness-transition-temperature of high-toughness adhesives described in earlier reports is discussed. The second section is a study of stress corrosion cracking SSC susceptibility as a function of temperature for one commercial and one experimental high-toughness adhesive. The third section deals with room and elevated temperature fatigue or corrosion fatigue and presents crack growth rates and threshold data for room temperature SCC resistant commercial and experimental high toughness adhesives and one simple system. GRA

N75-22831# California Univ., Berkeley. Dept. of Mechanical Engineering.
ON THE NATURE OF NORMALITY OF PLASTIC STRAIN RATE AND CONVEXITY OF YIELD SURFACES IN PLASTICITY
P. M. Naghdi and J. A. Trapp Jan. 1975 27 p refs
(Contract N00014-69-A-0200-1008; NR Proj. 064-436)
(AD-A006982; AM-75-1) Avail: NTIS CSCL 20/12

In a previous paper the authors derived two inequalities which place restrictions on the constitutive equation for the rate of plastic strain in a finitely deformed elastic-plastic material. Here they elaborate on the nature of the previously derived restrictions and obtain some additional results pertaining to the normality of the plastic strain rate and convexity of yield surfaces. Although in the main the discussions are carried out in the context of finite deformation, the nature of the restrictions for infinitesimal deformation is also examined. A special case of an elastic-plastic material in which the stress response is characterized by the stress rate and that of a rigid-plastic material are given detailed attention. GRA

N75-22505 Aeritalia, Turin (Italy).
FINITE-ELEMENT METHOD APPLICATIONS IN THE DESIGN OF AEROSPACE STRUCTURES
P. Piantella *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 3-14 (For availability see N75-22504 14-31)

N75-22506 Liege Univ. (Belgium). Lab. des Techniques Aeronautiques et Spatiales.
RECENT PROGRESS IN THE ANALYSIS OF STRUCTURES USING THE FINITE ELEMENT METHOD [RECENTS PROGRES DANS L'ANALYSE DES STRUCTURES PAR LA METHODE DES ELEMENTS FINIS]
G. Sander *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 15-42 refs In FRENCH (For availability see N75-22504 14-31)

N75-22528 Societe de Production et de Developpement Radio-Electrique, Paris (France).
A FULLY COMPUTERIZED SYSTEM FOR DETERMINING MATHEMATICAL MODELS OF STRUCTURES
J. A. Baticle *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 395-397 (For availability see N75-22504 14-31)

N75-22529 Societe de Production et de Developpement Radio-Electrique, Paris (France).
NEW COMPUTERIZED EQUIPMENT FOR EXPERIMENTAL DETERMINATION OF DYNAMIC CHARACTERISTICS OF STRUCTURES
J. Perruchot *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 398-402 (For availability see N75-22504 14-31)

N75-22536 Erno Raumfahrttechnik G.m.b.H., Bremen (West Germany).
PRACTICAL APPLICATION OF FRACTURE MECHANICS FOR JUDGEMENT OF THE SPACELAB MODULE STRUCTURE
J. Walter *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 489-495 refs (For availability see N75-22504 14-31)

N75-22538 Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
DYNAMIC CHARACTERISTICS OF STRUCTURES DETERMINED USING POINT EXCITATION VIBRATION TESTING [DETERMINATION DES CARACTERISTIQUES DYNAMIQUES D'UNE STRUCTURE A PARTIR D'UN ESSAI DE VIBRATIONS AVEC EXCITATION PONCTUELLE]
R. Dat *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 511-518 refs In FRENCH (For availability see N75-22504 14-31)
Avail: NTIS

N75-22543 Battelle Inst., Frankfurt am Main (West Germany).
ACOUSTIC EMISSION: A NEW NONDESTRUCTIVE TESTING METHOD FOR HIGHLY RELIABLE STRUCTURES
J. Becht and J. Eisenblaetter *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 557-569 refs (For availability see N75-22504 14-31)

N75-22544 Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany).
COMPUTATIONAL TOOLS AND EXPERIMENTAL FACILITIES FOR SHELL BUCKLING AND FATIGUE INVESTIGATIONS
B. Geier *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 571-580 refs (For availability see N75-22504 14-31)

N75-22545 Commissariat a l'Energie Atomique, Le Barp (France). Centre d'Etudes Scientifiques et Techniques d'Aquitaine.
ACQUISITION AND DIGITAL PROCESSING OF ENVIRONMENTAL DATA [ACQUISITION ET TRAITEMENT NUMERIQUE DE DONNEES D'ENVIRONNEMENT]
J. M. Bouquin *In* ESRO Large Struct. for Manned Spacecraft Mar. 1974 p 581-602 refs In FRENCH (For availability see N75-22504 14-31)

N75-22849 Joint Publications Research Service, Arlington, Va.
CALCULATING THE WIND LOADS ON HIGH-RISE STRUCTURES
M. V. Zavarina and L. I. Kutepova *In its* Meteorol. and Hydrology, No. 2, 1975 (JPRS-64670) 1 May 1975 p 128-130 ref Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 12, 1975 p 104-106 (For availability see N75-22834 14-42)

42 GEOSCIENCES (GENERAL)

N75-22832# Joint Publications Research Service, Arlington, Va.
SOVIET-BLOC RESEARCH IN GEOPHYSICS, ASTRONOMY, AND SPACE, NO. 346
16 Apr. 1975 42 p refs Transl. into ENGLISH from Russian reports
(JPRS-64563) Avail: NTIS HC $3.75

Translations and abstracts of articles on meteorology, oceanography, upper atmosphere and space research, astronomy and terrestrial geophysics are given covering both science news and formal scientific reports. Published details of Soviet space 'spectaculars' are included. Author

N75-22833# Joint Publications Research Service, Arlington, Va.
SOVIET-BLOC RESEARCH IN GEOPHYSICS, ASTRONOMY, AND SPACE, NO. 347
1 May 1975 62 p Transl. into ENGLISH from Russian Reports
(JPRS-64669) Avail: NTIS HC $4.25

Translations and abstracts of articles on meteorology, oceanography, upper atmosphere and space research, astronomy and terrestrial geophysics, covering both science news and formal scientific reports are presented. Published details of Soviet space spectaculars are included. Author

N75-22834# Joint Publications Research Service, Arlington, Va.
METEOROLOGY AND HYDROLOGY, NO. 2, 1975
1 May 1974 177 p refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 2, 1975 p 3-118
(JPRS-64670) Avail: NTIS HC $7.00

Articles are presented on microclimatology, agricultural meteorology, weather forecasting, climate control, hydrological forecasting, atmospheric circulation, hydrology, cloud formation, water pollution, air pollution, and long range weather forecasting. For individual titles, see N75-22835 through N75-22854.

N75-22835 Joint Publications Research Service, Arlington, Va.
CENTER OF ATMOSPHERIC CIRCULATION c46
N. A. Bagrov *In its* Meteorol. and Hydrology, No. 2, 1975 (JPRS-64670) 1 May 1975 p 1-12 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 2, 1975 p 3-11 (For availability see N75-22834 14-42)

A survey is presented of various methods used for defining the position of the center of atmospheric circulation. One definition discussed is that the center of circulation is the center of gravity of the outline of an isohypse encompassing the geographic pole and the special polar baric formations. The advantages and disadvantages of all the methods are presented along with the mean seasonal movement of the center of circulation. M.J.S.

N75-22836 Joint Publications Research Service, Arlington, Va.
CALCULATING PRECIPITATION BY THE HYDRODYNAMIC MODEL OF THE ATMOSPHERE c47
V. M. Kadyshnikov *In its* Meteorol. and Hydrology, No. 2, 1975 (JPRS-64670) 1 May 1975 p 13-24 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 2, 1975 p 12-21 (For availability see N75-22834 14-42)

A hydrodynamic model was investigated which takes into consideration the relief of latent heat of condensation and the heat absorption during evaporation of moisture falling in the unsaturated layer of air. Finite difference formulas were used in the calculations, and the possibility of vapor transformation from the unsaturated to the saturated state was considered. It is shown that the consideration of the phase transitions of the moisture does not impose restrictions on the time step magnitude of the linearized finite difference scheme. Other topics discussed include hydrodynamic equations, calculation stability, temperature variations, specified humidity, and weather forecasting. Author

N75-22837 Joint Publications Research Service, Arlington, Va.
SOME PECULIARITIES OF THE INTRATROPICAL ZONE OF CONVERGENCE ACCORDING TO OBSERVATIONS FROM METEOROLOGICAL SATELLITES c46
Ye. K. Semenov *In its* Meteorol. and Hydrology, No. 2, 1975 (JPRS-64670) 1 May 1975 p 25-34 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 2, 1975 p 22-29 (For availability see N75-22834 14-42)

Maps of the recurrence rate of cloud clusters in the intratropical zone of convergence were constructed for each central month of the season according to meteorological satellite data. The basic characteristics of the mean distribution of these cloud clusters over the Eastern Hemisphere are discussed. The year around existence of two branches of the cloud clusters north and south of the equator in the equatorial regions was discovered which indicates the presence of two intratropical zones of convergence. The annual migration laws of the cloud clusters in both zones are analyzed, and the discontinuity of the Indo-Chinese and African northern branches of the clouds during the entire year is indicated. A comparison was made between the distribution of the cloud clusters in the intratropical zone of convergence and the aeroclimatic peculiarities of the equatorial zone of the west winds. Author

N75-22838 Joint Publications Research Service, Arlington, Va.
TIME OF COMMENCEMENT OF STRATIFORMIS CLOUD FORMATION c47
B. P. Kudryavtsev *In its* Meteorol. and Hydrology, No. 2, 1975 (JPRS-64670) 1 May 1975 p 35-43 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 2, 1975 p 30-36 (For availability see N75-22834 14-42)

Low stratiformis cloud formation under the blocking layer of the atmospheric boundary layer was investigated along with the role played by turbulent heat and moisture exchange. The effect of various physical factors, including nonadiabatic factors, on the occurrence of the clouds is discussed, and the conditions promoting and preventing the cloud formation are defined. It was found that (1) the time of formation decreases with a decrease in the ground pressure of the dew point and an increase in the blocking layer altitude; (2) the formation time for such clouds increases with an increase in the radiation balance and a decrease in the evaporation rate; (3) the vertical air movements significantly accelerate the cloud formation; and (4) the most favorable conditions for cloud formation exist for clear weather in the winter (night and day) and in the summer (night.) M.J.S.

N75-22839 Joint Publications Research Service, Arlington, Va.
HARMONIC ANALYSIS OF TIME SERIES OF THE MEAN MONTHLY VALUES OF METEOROLOGICAL ELEMENTS c47
N. K. Grib, L. V. Kotelnikova, and N. A. Lepekhina *In its* Meteorol. and Hydrology, No. 2, 1975 (JPRS-64670) 1 May 1975 p 44-52 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 2, 1975 p 37-43 (For availability see N75-22834 14-42)

Air temperature and atmospheric pressure are analyzed by methods of the stationary random process theory. The analysis procedure is discussed. Estimates are presented for spectral densities, and the spectral and correlation functions were obtained using the observations of a number of stations. Author

N75-22840 Joint Publications Research Service, Arlington, Va.
CONSIDERATION OF MOISTURE WHEN CALCULATING THE HEIGHT OF THE CONVECTIVE LAYER c47
A. A. Zhelnin and A. P. Khain *In its* Meteorol. and Hydrology, No. 2, 1975 (JPRS-64670) 1 May 1975 p 53-57 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 2, 1975 p 44-47 (For availability see N75-22834 14-42)

The convective cloud bank observation data from satellites were analyzed; the observations were performed synchronously with radio sounding of the atmosphere. It was shown that when determining the height of the convective layer, it is necessary to consider the vertical moisture distribution. From an analysis of the dew point and temperature profiles, it is concluded that the upper cloud boundary coincides with the lower boundary of the atmospheric blocking layer or exceeds it insignificantly. M.J.S.

N75-22841 Joint Publications Research Service, Arlington, Va.
STUDY OF THE NATURE OF CHEMICAL POLLUTION DISTRIBUTION IN THE GULF STREAM REGION AND ITS EFFECT ON THE PRIMARY PRODUCTIVITY OF THE OCEAN WATER c45
S. G. Oradovskiy, A. I. Simonov, and A. A. Yushchak *In its* Meteorol. and Hydrology, No. 2, 1975 (JPRS-64670) 1 May 1975 p 58-69 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 2, 1975 p 48-58 (For availability see N75-22834 14-42)

The basic results of expeditionary studies in the North Atlantic are discussed. Water pollutants were determined (petroleum products, organo-chlorine pesticides, mercury, and detergents), arsenic content was analyzed, and samples were taken for heavy metal content (lead, copper, zinc, nickel, and cobalt). A specific analysis of spatial distribution maps of mercury, petroleum products, and detergents in the ocean surface layer indicate that the seawater pollution fields are formed off the coast of Western Europe and North America, and are carried off by the Gulf Stream. The water circulation systems in this part of the ocean promote the spread of pollution to very great distances from the discharge sources. It was found that chemical pollution causes sharp intensification of the chlorophyl decomposition process and pheophytin formation, and mercury causes mass loss of plankton and disturbs the ecological balance of the ocean. M.J.S.

N75-22842 Joint Publications Research Service, Arlington, Va.
APPLICATION OF DISCRIMINANT ANALYSIS FOR LONG-RANGE FORECASTING OF THE APPEARANCE AND DISAPPEARANCE OF ICE IN THE ARAL SEA c46
V. V. Oganesyan *In its* Meteorol. and Hydrology, No. 2, 1975 (JPRS-64670) 1 May 1975 p 70-78 refs Transl. into ENGLISH

from Meteorol. i Gidrol. (Moscow), no. 2, 1975 p 59-65 (For availability see N75-22834 14-42)

A method is proposed for forecasting ice formation and disappearance, and estimates are presented of the quality of the method's forecast equations. Other topics discussed include vector analysis, linear equations, matrices (mathematics), error analysis, and probability density functions. M.J.S.

N75-22843 Joint Publications Research Service, Arlington, Va.
REDUCTION OF THE MAXIMUM RAIN RUNOFF MODULES WITH RESPECT TO AREA c43
Ye. D. Gopchenko *In its* Meteorol. and Hydrology, No. 2, 1975 (JPRS-64670) 1 May 1975 p 79-85 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 2, 1975 p 66-71 (For availability see N75-22834 14-42)

Bases for the reduction of the maximum rain flood moduli are the phenomena of splitting of the flood waves into layers during the lag process before the calculation sections, the time-space nonuniformity of the flood forming precipitation fields, and the transforming peculiarities of the underlying surfaces. The reduction coefficients were determined on the basis of solving the inverse problem within the framework of the Befani genetic scheme. Single-step iteration was used to solve the operator equations, and the reduction coefficients (with an increase in the size of the watershed areas) were determined for various districts of the U.S.S.R. M.J.S.

N75-22844 Joint Publications Research Service, Arlington, Va.
DETERMINATION OF THE MAXIMUM SNOW RESERVES BY THE AEROVISUAL OBSERVATIONS IN THE EXPERIMENTAL BASIN OF THE VARZOB RIVER c43
A. V. Kalachev, V. P. Kanushin, and G. A. Kernosov *In its* Meteorol. and Hydrology, No. 2, 1975 (JPRS-64670) 1 May 1975 p 86-93 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 2, 1975 p 72-77 (For availability see N75-22834 14-42)

Remote stakes installed in hard-to-reach high altitude regions of the basin were observed from helicopters in order to determine the depth of the snow cover. A stable snow density gradient was obtained for the period of maximum snow reserves, and by using the snow density gradient, the water reserve in high altitude snow regions was calculated. Author

N75-22845 Joint Publications Research Service, Arlington, Va.
CONSTRUCTION OF A CLOSED SYSTEM OF ENERGY AND MASS EXCHANGE EQUATIONS FOR CALCULATING THE BIOMASS OF FARM CROPS c43
O. D. Sirotenko and A. P. Boyko *In its* Meteorol. and Hydrology, No. 2, 1975 (JPRS-64670) 1 May 1975 p 94-106 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 2, 1975 p 78-87 (For availability see N75-22834 14-42)

A closed system of ordinary and parabolic differential equations was investigated which, when integrated for the known values of standard meteorological variables, can calculate the biomass of crop fields as a function of time during vegetative development period. The model was designed for solving the theoretical and applied problems connected with estimating the agrometeorological conditions of harvest growth. The sorption isotherm was used as the boundary condition at the soil surface for the water transport equations, and an analytical expression for the function describing the intensity of water absorption by plant roots was obtained. Author

N75-22846 Joint Publications Research Service, Arlington, Va.
THE PECULIARITIES OF LONG-WAVE RADIATION FLUX DISTRIBUTION IN THE EQUATORIAL ATLANTIC IN THE SUMMER OF 1972 (ACCORDING TO THE ACTINOMETRIC RADIOSOUNDING DATA) c46
N. A. Zaytseva and T. M. Krasnova *In its* Meteorol. and Hydrology, No. 2, 1975 (JPRS-64670) 1 May 1975 p 107-119 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 2, 1975 p 88-98 (For availability see N75-22834 14-42)

Meridional behavior and time variations of long wave radiation fluxes in a free atmosphere above the Atlantic were investigated. Radiosondes were used to measure vertical profiles of the ascending and descending long wave radiations fluxes and the effective radiation of the earth-atmosphere system. The results and conclusions are discussed. M.J.S.

N75-22847 Joint Publications Research Service, Arlington, Va.
APPLICATION OF QUEUEING THEORY TO THE ANALYSIS OF VARIATIONS OF THE WEATHER CONDITIONS ALONG THE LINE AT THE EARTH'S SURFACE c47
A. I. Tamazov *In its* Meteorol. and Hydrology, No. 12, 1975 (JPRS-64670) 1 May 1975 p 120-123 Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 12, 1975 p 99-101 (For availability see N75-22834 14-42)

A mathematical model is proposed for calculating the weather condition variations along a particular line on the earth's surface. Histograms of the results are given along with probability distribution functions. M.J.S.

N75-22848 Joint Publications Research Service, Arlington, Va.
DETERMINING THE DISPLACEMENT RATE OF ISOBARS c47
V. D. Volik and F. T. Doroshenko *In its* Meteorol. and Hydrology, No. 2, 1975 (JPRS-64670) 1 May 1975 p 124-147 Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 12, 1975 p 101-104 (For availability see N75-22834 14-42)

A formula is derived for determining the displacement rate of isobars by the data on the baric trend and the horizontal baric stage. A numerical analysis of the problem is presented. Author

N75-22849 Joint Publications Research Service, Arlington, Va.
CALCULATING THE WIND LOADS ON HIGH-RISE STRUCTURES c39
M. V. Zavarina and L. I. Kutepova *In its* Meteorol. and Hydrology, No. 2, 1975 (JPRS-64670) 1 May 1975 p 128-130 ref Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 12, 1975 p 104-106 (For availability see N75-22834 14-42)

Calculated wind velocities determined by the periodic observations were compared with calculated velocities obtained from frequent wind sounding of the atmosphere. Results of the calculations were used to determine wind loads on high-rise structures (300-500 meters). M.J.S.

N75-22850 Joint Publications Research Service, Arlington, Va.
AGROMETEOROLOGICAL PECULIARITIES OF ANOMALOUS SPRINGS IN BELORUSSIA c47
L. K. Pyatovskaya *In its* Meteorol. and Hydrology, No. 2, 1975 (JPRS-64670) 1 May 1975 p 132-134 Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 12, 1975 p 106-107 (For availability see N75-22834 14-42)

The conditions were investigated of the winter-spring period in Belorussia for a 20-year period, from 1948 to 1968. A study was made of the following characteristics which determine the beginning of the spring: the date of stable transition of the maximum air temperature to 0 C in the spring, characterizing the beginning of thawing of the snow; the date of stable transition of the mean diurnal air temperature through 0 C; the date of stable transition of the mean diurnal air temperature through +5 C; the date of removal of the snow cover; the depth of the snow cover on the date of the beginning of the thaw which, in the majority of cases, is maximal for the winter; the depth of freezing of the soil on the date of the beginning of the snow thaw which (in the majority of cases) is maximal for the winter; and the amount of precipitation in millimeters for the drying period of the soil (from removal of the snow cover to the drying out of the soil to the moderately wet condition). Reasons for early springs were determined. Author

N75-22851 Joint Publications Research Service, Arlington, Va.
AIRCRAFT DC THERMOANEMOMETER c06
V. P. Kukharets *In its* Meteorol. and Hydrology, No. 2, 1975 (JPRS-64670) 1 May 1975 p 135-139 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 12, 1975 p 108-110 (For availability see N75-22834 14-42)

An aircraft dc thermoanemometer is described and compared with a constant temperature thermoanemometer. It was used to measure turbulent fluxes in the atmospheric boundary layer. The pulsation spectra of horizontal wind velocity are also given in graph form. Author

N75-22852 Joint Publications Research Service, Arlington, Va.
REFLECTIVITY OF CERTAIN MATERIALS IN THE SPECTRAL REGION OF 1-13 MICRONS c74

O. I. Popov, V. I. Semenova, and Ye. O. Fedorova *In its* Meteorol. and Hydrology, No. 2, 1975 (JPRS-64670) 1 May 1975 p 140-144 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 2, 1975 p 111-113 (For availability see N75-22834 14-42)

The results are presented of spectral reflectivity measurements of some natural and artificial materials in the 1-13 spectral range, which were obtained on an IKS-11 spectrometer. It is shown that the reflectivity data obtained agree with individual results available in literature. The materials examined included concrete, yellow sand of medium grain size, bitumen, green and red PVC paint on a metal backing, tar paper, gravel (limestone), spruce needle, fresh snow, coarse-grained thawing snow, wet concrete, wet gravel, and sand with 45% moisture. Author

N75-22853 Joint Publications Research Service, Arlington, Va.
RADAR MEASUREMENT OF THE SEAWAVE PARAMETERS **c48**
Ye. O. Zhilko, A. A. Zagorodnikov, and I. V. Kireyev *In its* Meteorol. and Hydrology, No. 2, 1975 (JPRS-64670) 1 May 1975 p 145-151 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 12, 1975 p 113-117 (For availability see N75-22834 14-42)

Experimental data are presented for the determination of the mean square height of the waves (with respect to the width of the Doppler spectrum of the radio signal reflected from the sea surface). Other topics discussed include antenna radiation patterns, radar echoes, kinetic energy of waves, and wind velocity. Author

N75-22854 Joint Publications Research Service, Arlington, Va.
USE OF THE DAVITAYA FIELD RAIN GAUGE AS A CUMULATING INSTRUMENT **c47**
N. N. Podgayskiy *In its* Meteorol. and Hydrology, No. 2, 1975 (JPRS-64670) 1 May 1975 p 152-153 Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 2, 1975 p 117-118 (For availability see N75-22834 14-42)

The results are presented of a comparison of amounts of falling atmospheric precipitation reckoned by the Tret'yakov rain gauge and the field rain gauges. Author

N75-22855# Army Cold Regions Research and Engineering Lab., Hanover, N.H.
CONTRIBUTION TO THE CHEMISTRY OF ANTARCTIC SNOW: DETERMINATION OF TRACE ELEMENTS AT THE PPB LEVEL BY ATOMIC ABSORPTION SPECTROMETRY
Claude Boutron Jan. 1975 85 p refs Transl. into ENGLISH from Natl. Rech. Sci. (Grenoble), no. 138, 10 May 1971
(AD-A007112; CRREL-TL-424) Avail: NTIS CSCL 08/12

The composition of the impurities contained in Antarctic snow has yet to be established. This work is based primarily on the study of geographical variations and on the establishment of a fallout table, backed up by some observations as to the identification of the various possible origins. Analysis by atomic absorption spectrometry of the elements sodium, magnesium, calcium, potassium and iron is performed as well as analysis by neutron activation of the elements chlorine, sodium, and manganese. Sampling procedures and sample preparation, as well as analytical techniques, are discussed. GRA

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography. For instrumentation see *35 Instrumentation and Photography*.

N75-22856 California Univ., San Diego.
THE HAWAIIAN-EMPEROR SEAMOUNT CHAIN: ITS ORIGIN, PETROLOGY, AND IMPLICATIONS FOR PLATE TECTONICS Ph.D. Thesis
David Alan Clague 1974 337 p
Avail: Univ. Microfilms Order No. 75-8253

A magnetic anomaly map of the Mesozoic Hawaiian lineations which demonstrates that the Hawaiian Ridge and southern Emperor Seamounts cut obliquely across underlying crustal structure is revised. Samples from seamounts in the western Hawaiian Ridge and southern Emperor Seamount were dredged and analyzed. Results show that (1) the bend between the chains is 41 to 43 million years old; (2) the volume of magna erupted per unit time is a function of the rate of volcanic migration along the chain; (3) the magna generation is due to shear melting rather than a deep mantle plume; and (4) tholeitic basalts found on seamounts in the Emperor Seamount chain support the hypothesis that the Hawaiian-Emperor chain is a single feature with a common origin. Pacific plate motion relative to underlying melting spots is modeled by rotation about a pole, indicating that Pacific equatorial sedimentation patterns and paleomagnetic data are consistent with the assumption that Pacific plate melting spots are fixed with respect to the equator and earth's spin axis. Dissert. Abstr.

N75-22857 Purdue Univ., Lafayette, Ind.
MULTI-IMAGE MODELING Ph.D. Thesis
Jai Narain Gupta 1974 117 p
Avail: Univ. Microfilms Order No. 75-10883

An image model is presented having application to various image processing techniques such as efficient coding, information extraction, and pattern recognition. The image is modeled in the form of primitivies called blobs; an algorithm for locating grey level and/or texture blobs in digitized images is developed. The algorithm is based on the concept of hypotheses testing. The digitized picture is first subdivided into subsets of picture elements, e.g., 2 x 2 arrays. The algorithm compares the first and second order statistics of adjacent subsets; adjacent subsets having similar first and second order statistics are merged into blobs. In this manner the entire picture is separated into blobs such that the picture elements within each blob have similar grey levels and/or textures. By varying either of two parameters the amount of consideration given to grey level and texture can be adjusted. Dissert. Abstr.

N75-22858 Oklahoma Univ., Norman.
OIL DISPLACEMENT BY DIFFERENT SURFACTANT AND POLYMER WATERFLOOD SYSTEMS Ph.D. Thesis
Adel El-Sayed Ali El-Messidi 1974 178 p
Avail: Univ. Microfilms Order No. 75-11244

Rheological studies for four different fluid systems of oil recovery by waterflooding were conducted. The fluid systems are: conventional waterflooding, polymer waterflooding, polymer-surfactant waterflooding, and surfactant waterflooding. The cone and plate viscometer was used for such purpose for most of the investigated solutions, and the obtained data fit the power law equation. A Cannon Ubbelohde Capillary Viscometer was also used for the viscosity measurements for different solutions used in the oil displacement experiemtns. A Du Nouy tensiometer was also used to investigate the property of surface and interfacial tension of the different solutions. It was clear that the surfactants always had a great influence on these properties when added to either brine or polymer-brine solutions. A study of the oil displacement mechanism was also conducted using Berea sandstone core samples. Dissert. Abstr.

N75-22859*# Earth Satellite Corp., Berkeley, Calif.
PLAN FOR THE UNIFORM MAPPING OF EARTH RESOURCES AND ENVIRONMENTAL COMPLEXES FROM SKYLAB IMAGERY Monthly Progress Report, 1 Mar. - 31 Mar. 1975
Charles E. Poulton, Principal Investigator 31 Mar. 1975 4 p EREP
(Contract NAS9-13286)
(E75-10242; NASA-CR-142535) Avail: NTIS HC $3.25 CSCL 08B

There are no author-identified significant results in this report.

N75-22860*# National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
REMOTE SENSING OF OCEAN CURRENT BOUNDARY LAYER Monthly Report, Mar. 1975
George A. Maul, Principal Investigator 17 Apr. 1975 2 p EREP
(NASA Order T-4713-B)
(E75-10243; NASA-CR-142536) Avail: NTIS HC $3.25 CSCL 08C

There are no author-identified significant results in this report.

N75-22861*# Earth Satellite Corp., Berkeley, Calif.
EVALUATION OF USEFULNESS OF SKYLAB EREP S-190 AND S-192 IMAGERY IN MULTISTAGE FOREST SURVEYS Progress Report, 1 Jul. 1974 - Feb. 28 1975
Philip G. Langley, Principal Investigator 28 Feb. 1975 5 p EREP
(Contract NAS9-13289)
(E75-10244; NASA-CR-142537) Avail: NTIS HC $3.25 CSCL 02F

There are no author-identified significant results in this report.

N75-22862*# Environmental Research Inst. of Michigan, Ann Arbor. Resources and Technology Div.
MAPPING EXPOSED SILICATE ROCK TYPES AND EXPOSED FERRIC AND FERROUS COMPOUNDS FROM A SPACE PLATFORM Quarterly Report, 8 Sep. - 8 Dec. 1974
Frederick J. Thomson, Principal Investigator 6 Mar. 1975 3 p EREP
(Contract NAS9-13317)
(E75-10250; NASA-CR-142625; ERIM-102000-32-L) Avail: NTIS HC $3.25 CSCL 08B

There are no author-identified significant results in this report.

N75-22863*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
MAPPING EXPOSED SILICATE ROCK TYPES AND EXPOSED FERRIC AND FERROUS COMPOUNDS FROM A SPACE PLATFORM Quarterly Report, 8 Dec. 1974 - 8 Mar. 1975
Frederick J. Thomson, Principal Investigator 12 Mar. 1975 7 p ref EREP
(Contract NAS9-13317)
(E75-10251; NASA-CR-142626; ERIM-102000-33-L) Avail: NTIS HC $3.25 CSCL 08B

There are no author-identified significant results in this report.

N75-22864*# Colorado School of Mines, Golden. Dept. of Geology.
GEOLOGIC AND MINERAL AND WATER RESOURCES INVESTIGATIONS IN WESTERN COLORADO, USING SKYLAB EREP DATA Monthly Progress Report, Mar. - Apr. 1975
Keenan Lee, Principal Investigator 7 May 1975 5 p EREP
(Contract NAS9-13394)
(E75-10252; NASA-CR-142627) Avail: NTIS HC $3.25 CSCL 08F

There are no author-identified significant results in this report.

N75-22865*# Oklahoma Univ., Norman. Atmospheric Research Lab.
RECTIFICATION OF A WHOLE-SKY PHOTOGRAPH AS A TOOL FOR DETERMINING SPATIAL POSITIONING OF CUMULUS CLOUDS
Bob E. Stucky, Principal Investigator Apr. 1975 22 p refs EREP
(Contract NAS9-13360)
(E75-10253; NASA-CR-141783; WEAT-18) Avail: NTIS HC $3.25 CSCL 14E

There are no author-identified significant results in this report.

N75-22866*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
AN INTERDISCIPLINARY ANALYSIS OF MULTISPECTRAL SATELLITE DATA FOR SELECTED COVER TYPES IN THE COLORADO MOUNTAINS, USING AUTOMATIC DATA PROCESSING TECHNIQUES Monthly Progress Report, Mar. 1975
Roger M. Hoffer, Principal Investigator Mar. 1975 11 p Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 EREP
(Contract NAS9-13380)
(E75-10254; NASA-CR-142629) Avail: NTIS HC $3.25 CSCL 08F

The author has reported the following significant results. A data set containing SKYLAB, LANDSAT, and topographic data has been overlayed, registered, and geometrically corrected to a scale of 1:24,000. After geometrically correcting both sets of data, the SKYLAB data were overlayed on the LANDSAT data. Digital topographic data were then obtained, reformatted, and a data channel containing elevation information was then digitally overlayed onto the LANDSAT and SKYLAB spectral data. The 14,039 square kilometers involving 2,113, 776 LANDSAT pixels represents a relatively large data set available for digital analysis. The overlayed data set enables investigators to numerically analyze and compare two sources of spectral data and topographic data from any point in the scene. This capability is new and it will permit a numerical comparison of spectral response with elevation, slope, and aspect. Utilization of the spectral and topographic data together to obtain more accurate classifications of the various cover types present is feasible.

N75-22867*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
STUDY OF THE UTILIZATION OF EREP DATA FROM THE WABASH RIVER BASIN Monthly Report, Mar. 1975
LeRoy F. Silva, Principal Investigator Mar. 1975 3 p EREP
(Contract NAS9-13301)
(E75-10255; NASA-CR-142630) Avail: NTIS HC $3.25 CSCL 08F

The author has identified the following significant results. The results so far indicate that filtering the S192 data helped improve the data for machine processing. Bands 1 and 2 improved considerably. Since bands 4, 5, 6, and 12 were unavailable, no conclusions can be drawn for those bands. Little change has been shown so far in the other bands.

N75-22868*# Cornell Univ., Ithaca, N.Y. Coll. of Agriculture.
EVALUATION OF SKYLAB IMAGERY AS AN INFORMATION SERVICE FOR INVESTIGATING LAND USE AND NATURAL RESOURCES Progress Report, Mar. 1975
Ernest E. Hardy, Principal Investigator 31 Mar. 1975 2 p EREP
(Contract NAS9-13364)
(E75-10256; NASA-CR-142631) Avail: NTIS HC $3.25 CSCL 08B

There are no author-identified significant results in this report.

N75-22869*# Pennsylvania State Univ., University Park. Space Science and Engineering Lab.
INTERDISCIPLINARY APPLICATION AND INTERPRETATION OF EREP DATA WITHIN THE SUSQUEHANNA RIVER BASIN Quarterly Progress Report, Mar. - May 1974
George J. McMurtry and Gary W. Petersen, Principal Investigators Jun. 1974 10 p EREP
(Contract NAS9-13406)
(E75-10258; NASA-CR-142634) Avail: NTIS HC $3.25 CSCL 08F

There are no author-identified significant results in this report.

N75-22870*# Pennsylvania State Univ., University Park. Space Science and Engineering Lab.
INTERDISCIPLINARY APPLICATION AND INTERPRETATION OF EREP DATA WITHIN THE SUSQUEHANNA RIVER BASIN Quarterly Progress Report, Jun. - Aug. 1974
George J. McMurtry and Gary W. Petersen, Principal Investigators Sep. 1974 6 p EREP
(Contract NAS9-13406)
(E75-10259; NASA-CR-142635) Avail: NTIS HC $3.25 CSCL 08F

There are no author-identified significant results in this report.

N75-22871*# Pennsylvania State Univ., University Park. Space Science and Engineering Lab.

INTERDISCIPLINARY APPLICATION AND INTERPRETATION OF EREP DATA WITHIN THE SUSQUEHANNA RIVER BASIN Quarterly Progress Report, Sep. - Nov. 1974
George J. McMurtry and Gary W. Petersen, Principal Investigators Dec. 1974 5 p EREP
(Contract NAS9-13406)
(E75-10260; NASA-CR-142633) Avail: NTIS HC $3.25 CSCL 08F

There are no author-identified significant results in this report.

N75-22872*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
REMOTE BATHYMETRY AND SHOAL DETECTION WITH ERTS: ERTS WATER DEPTH Final Report, Jun. 1972 - Jun. 1974
Fabian C. Polcyn, Principal Investigator and David R. Lyzenga Apr. 1975 49 p refs Original contains color illustrations. Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21783)
(E75-10261; NASA-CR-142636; ERIM-193300-51-F) Avail: NTIS HC $3.75 CSCL 08J

There are no author-identified significant results in this report.

N75-22873*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
ANALYSIS OF RECREATIONAL LAND AND OPEN SPACE USING ERTS-1 DATA Final Report, Jun. 1972 - Nov. 1974
Irvin J. Sattinger, Principal Investigator, Robert D. Dillman, and Norman E. G. Roller Apr. 1975 42 p refs Original contains color illustrations. Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21783)
(E75-10262; NASA-CR-142637; ERIM-193300-60-F) Avail: NTIS HC $3.75 CSCL 08B

There are no author-identified significant results in this report.

N75-22874*# Agricultural Research Service, Weslaco, Tex.
IRRIGATION SCHEDULING, FREEZE WARNING AND SOIL SALINITY DETECTING Monthly Progress Report, Apr. 1975
Craig L. Wiegand, Principal Investigator May 1975 15 p refs EREP
(NASA Order T-4105-B)
(E75-10263; NASA-CR-142638; MPR-16) Avail: NTIS HC $3.25 CSCL 02C

There are no author-identified significant results in this report.

N75-22875*# Maryland Dept. of State Planning, Baltimore.
APPLICATION OF ERTS-1 DATA TO INTEGRATED STATE PLANNING IN THE STATE OF MARYLAND Final Report
Edwin L. Thomas, David S. Simonett, Principal Investigators, John C. Antenucci, William G. Brooner, and Darryl R. Goehring Dec. 1974 182 p refs Prepared in cooperation with Earth Satellite Corp., Washington, D. C. Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21779)
(E75-10264; NASA-CR-142639) Avail: NTIS HC $7.00 CSCL 05B

There are no author-identified significant results in this report.

N75-22876*# Hunting Surveys, Ltd., Boreham Wood (England).
STUDY OF TECHNIQUES AND APPLICATIONS OF SATELLITE IMAGERY TO SMALL SCALE MAPPING Final Report
P. G. Mott, Principal Investigator, H. Fullard (Phillip (George) and Son, Ltd.), J. C. Bartholomew (Bartholomew (John) and Son, Ltd.), J. D. Leatherdale, H. J. Chisom, and J. K. Wilcox 1 Mar. 1975 57 p Sponsored by NASA Original contains color illustrations. Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(E75-10265; NASA-CR-142640) Avail: NTIS HC $4.25 CSCL 08B

There are no author-identified significant results in this report.

N75-22877*# Geological Survey, Menlo Park, Calif.
PRINCIPAL SOURCES AND DISPERSAL PATTERNS OF SUSPENDED PARTICULATE MATTER IN NEARSHORE SURFACE WATERS OF THE NORTHEAST PACIFIC OCEAN Final Report, 1 Sep. 1972 - 1 Jan. 1974
Paul R. Carlson, Principal Investigator, T. John Conomos, Richard J. Janda, and David H. Peterson 10 Feb. 1975 145 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(NASA Order S-70243-AG-7)
(E75-10266; NASA-CR-142641) Avail: NTIS HC $5.75 CSCL 08J

There are no author-identified significant results in this report.

N75-22878*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
STUDY OF THE UTILIZATION OF EREP DATA FROM THE WABASH RIVER BASIN Monthly Report, Apr. 1975
Leroy F. Silva, Principal Investigator Apr. 1975 3 p EREP
(Contract NAS9-13301)
(E75-10267; NASA-CR-142642) Avail: NTIS HC $3.25 CSCL 05B

The author has identified the following significant results. Information was obtained during the meeting with the Allen County Plan Commission which indicates that the SL/4 S192 analysis results over the Allen County area are much more accurate than the figures that were given in the paper to be presented at the Purdue Symposium.

N75-22879*# Geological Survey, Reston, Va.
URBAN AND REGIONAL LAND USE ANALYSIS: CARETS AND CENSUS CITIES EXPERIMENT PACKAGE Monthly Progress Report, Apr. 1975
Robert Alexander, Principal Investigator, Harry F. Lins, Jr., and D. B. Gallagher 20 Apr. 1975 4 p EREP
(NASA Order T-5290-B)
(E75-10268; NASA-CR-142643) Avail: NTIS HC $3.25

There are no author-identified significant results in this report.

N75-22880*# Wyoming Univ., Laramie. Dept. of Geology.
THE USE OF SKYLAB AND ERTS IN A GEOHYDROLOGICAL STUDY OF THE PALEOZOIC SECTION, WEST-CENTRAL BIGHORN MOUNTAINS, WYOMING
Barbara J. Tomes Mar. 1975 23 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 EREP
(Contract NAS9-13298)
(E75-10269; NASA-CR-142644) Avail: NTIS HC $3.25 CSCL 08G

There are no author-identified significant results in this report.

N75-22881*# Cornell Univ., Ithaca, N.Y. Div. of Atmospheric Sciences.
PHENOLOGY SATELLITE EXPERIMENT Final Report
Bernard E. Dethier, Principal Investigator Oct. 1974 781 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21781)
(E75-10270; NASA-CR-142679) Avail: NTIS HC $17.25 CSCL 08F

There are no author-identified significant results in this report.

N75-22882*# Environmental Research and Technology, Inc., Lexington, Mass.

THE APPLICATION OF ERTS IMAGERY TO MAPPING SNOW COVER IN THE WESTERN UNITED STATES: SUPPLEMENTAL REPORT Final Report, Jun. 1974 - Jan. 1975

James C. Barnes, Principal Investigator and Clinton J. Bowley Feb. 1975 48 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS

(Contract NAS5-21803)

(E75-10271; NASA-CR-142680; ERT-P-407-S) Avail: NTIS HC $3.75 CSCL 08L

There are no author-identified significant results in this report.

N75-22883*# Environmental Research and Technology, Inc., Lexington, Mass.

THE APPLICATION OF ERTS IMAGERY TO MONITORING ARCTIC SEA ICE: SUPPLEMENTAL REPORT Final Report, May - Dec. 1974

James C. Barnes, Principal Investigator, Clinton J. Bowley, and Michael D. Smallwood Jan. 1975 51 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS

(Contract NAS5-21802)

(E75-10272; NASA-CR-142681; ERT-P-408-S) Avail: NTIS HC $4.25 CSCL 08L

There are no author-identified significant results in this report.

N75-22884*# National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.

REMOTE SENSING OF OCEAN CURRENT BOUNDARY LAYER Monthly Progress Report, Apr. 1975

George A. Maul, Principal Investigator 5 May 1975 2 p EREP

(NASA Order T-4713-B)

(E75-10273; NASA-CR-142682) Avail: NTIS HC $3.25 CSCL 08J

There are no author-identified significant results in this report.

N75-22885*# South Dakota State Univ., Brookings. Remote Sensing Inst.

DEVELOP TECHNIQUES AND PROCEDURES, USING MULTISPECTRAL SYSTEMS, TO IDENTIFY FROM REMOTELY SENSED DATA THE PHYSICAL AND THERMAL CHARACTERISTICS OF PLANTS AND SOIL Monthly Progress Report, Mar. 1975

Victor I. Myers, Principal Investigator 20 Apr. 1975 2 p EREP

(Contract NAS9-13337)

(E75-10274; NASA-CR-142683) Avail: NTIS HC $3.25 CSCL 08F

There are no author-identified significant results in this report.

N75-22886*# Environmental Research Inst. of Michigan, Ann Arbor.

SKYLAB: WATER DEPTH DETERMINATION Quarterly Progress Report, 1 Dec. 1974 - 28 Feb. 1975

Fabian C. Polcyn and D. R. Lyzenga, Principal Investigators 25 Mar. 1975 3 p EREP

(Contract NAS9-13278)

(E75-10275; NASA-CR-142684; ERIM-102100-18-L) Avail: NTIS HC $3.25

There are no author-identified significant results in this report.

N75-22887*# Wyoming Univ., Laramie. Dept. of Geology.

MAPPING OF SELENIFEROUS VEGETATION AND ASSOCIATED SOILS IN THE LOWER WASATCH FORMATION, POWER RIVER BASIN, WYOMING

Kenneth E. Kolm Mar. 1975 25 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 EREP

(Contract NAS9-13298)

(E75-10276; NASA-CR-142685; EREP-S-75-1) Avail: NTIS HC $3.25 CSCL 08B

There are no author-identified significant results in this report.

N75-22888*# Alaska Univ., Fairbanks.

TECTONIC STRUCTURE OF ALASKA AS EVIDENCED BY ERTS IMAGERY AND ONGOING SEISMICITY Progress Report

Larry D. Gedney, Principal Investigator 4 Apr. 1975 17 p refs ERTS

(Contract NAS5-20803)

(E75-10277; NASA-CR-142686) Avail: NTIS HC $3.25 CSCL 08G

There are no author-identified significant results in this report.

N75-22889*# Water Survey of Canada, Ottawa (Ontario).

SENSOR DATA RETRANSMISSION BY SATELLITE

R. A. Halliday, Principal Investigator 1975 11 p refs Presented at the Can. Remote Sensing Soc. Workshop on remote Sensing of Snow Cover, Ottawa, 13-15 Jan. 1975 Sponsored by NASA ERTS

(E75-10278; NASA-CR-142687) Avail: NTIS HC $3.25 CSCL 05B

There are no author-identified significant results in this report.

N75-22890*# Department of the Environment, Ottawa (Ontario). Applied Hydrology Div.

RETRANSMISSION OF HYDROMETRIC DATA IN CANADA Progress Report, Oct. 1974 - Mar. 1975

R. A. Halliday, Principal Investigator and I. A. Reid Apr. 1975 8 p Sponsored by NASA ERTS

(E75-10279; NASA-CR-142688) Avail: NTIS HC $3.25 CSCL 08H

There are no author-identified significant results in this report.

N75-22891*# Clemson Univ., S.C. Dept. of Horticulture.

CROP STATUS EVALUATIONS AND YIELD PREDICTIONS Annual Summary Report, 1 Apr. 1974 - 31 Mar. 1975

J. R. Haun 24 Mar. 1975 41 p

(Contract NAS9-14006)

(NASA-CR-141786) Avail: NTIS HC $3.75 CSCL 02D

Daily data collected on spring and winter wheat development and environmental variables are presented. Data were collected in the field and in the greenhouse to provide data from conditions widely different climatically from commercial wheat areas. The daily growth rate as calculated for the average change in growth stage from the previous day of 25 tagged plants is given. Progress and results on the following phases of the program are reported: comparison of growth-environment relationships for wheat, barley and rye; evaluation of plant observation techniques; development of model for predicting the date on which 50% of the spring wheat crop is planted; development growth-rate prediction models for spring wheat; and development of model for predicting the date when spring wheat emerges in North Dakota. J.M.S.

N75-22892# Coastal Zone Management Inst., Sandwich, Mass.

COASTAL ZONE MANAGEMENT: THE PROCESS OF PROGRAM DEVELOPMENT

John Armstrong, Harold Bissell, Russell Davenport, Joel Goodman, Marc Hershman, Jens Sorenses, Lucy Sloan, and Daniel Wormhoudt Nov. 1974 391 p refs

(Grant NOAA-3-37157)

(COM-75-50066/0; NOAA-74121703) Avail: NTIS MF $2.25; HC $10.00 available from Coastal Zone Management Inst., P. O. Box 221, Sandwich, Mass. 02563 CSCL 13B

A technical guide for state and local officials involved in the development and implementation of coastal zone management programs is presented. It is organized in such a way as to parallel the requirements for management program development which are contained in the Coastal Zone Management Act of 1972 and the Section 305 regulations published November 29, 1973, in the Federal Register. GRA

N75-22893# Defense Mapping Agency, Washington, D.C.
THE METRIC CARTOGRAPHIC POTENTIAL OF GEOSTATIONARY/GEOSYNCHRONOUS SATELLITES
Nov. 1974 284 p refs
(AD-A006896; DMA-74-1) Avail: NTIS CSCL 08/2

This dissertation investigates the metric cartographic potential of a satellite camera 35,786 kms about the earth. Major pertinent areas were investigated and reported upon. These areas include: the geosynchronous orbit, design requirements of a suitable telescopic space camera, effects of geophysical phenomena upon the imagery sensors, electronic transmission link, and accuracy requirements for maps. GRA

N75-22894# Massachusetts Inst. of Tech., Cambridge. Dept. of Planetary Sciences.
ELECTRICAL RESISTIVITY OF SANDSTONE Final Report, Sep. 1973 - Sep. 1974
W. F. Brace Sep. 1974 38 p refs
(Contract DNA001-74-C-0057; DNA Proj. NWET-QAXS)
(AD-A006963; DNA-3468F) Avail: NTIS CSCL 08/7

The electrical resistivity of mixed company sandstone was investigated experimentally under confining pressure at room temperature. Both the effect of confining pressure (to 9 kbar) and the effect of stress (to 8 kbar) were investigated separately, as was the role of saturation and the freedom of pore fluids to be expelled during compression. GRA

N75-22895# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
CONCISE HANDBOOK ON SURVEYS FOR GRID CONSTRUCTION (SELECTED CHAPTERS)
N. N. Severyanov 24 Jan. 1975 143 p refs Transl. into ENGLISH from the monograph "Kratkii Spravochnik po Izyskaniiam. dlya Lineinogo Stroitelstva" Leningrad, 1972 p 25-34, 45-76, 86-107, 166-187
(AD-A007173; FTD-HC-23-1542-74) Avail: NTIS CSCL 08/2

Problems of field surveying are discussed, along with aerial methods of survey and geological engineering surveys. GRA

N75-22896# Massachusetts Inst. of Tech., Cambridge. Sea Grant Project Office.
MODELING AND GAMING FOR REGIONAL PLANNING, A MAINE STUDY
Charles Kaminski Sep. 1974 184 p refs
(Grant NOAA-NG-43-72)
(COM-75-10188/1; MITSG-74-25; NOAA-74122604) Avail: NTIS HC $7.00 CSCL 13B

A regional development model and a game are presented as aids in regional planning with particular application to the coastal area of Maine. The game described here was developed primarily to illustrate the application of gaming techniques to the planning process. The game was designed to reflect actual conditions in the coastal area of Maine, and its outcomes may have relevance to actual planning in that region. GRA

N75-22897# Auburn Univ., Ala. Engineering Experiment Station.
SOLVENT REFINED COAL STUDIES Progress Report, 1 Oct. 1973 - 31 May 1974
25 Jun. 1974 108 p refs
(Grant NSF GI-38701)
(PB-238532/6; NSF/RA/N-74-075) Avail: NTIS HC $5.25 CSCL 21D

Experimental results and model studies of solvent refining of coal are presented. The experimental apparatus, procedures, analyses, and results obtained to date are summarized. The following major topics are included: analysis of coal dissolution products; solvent characterization; hydrogenation apparatus, gas and liquid sampling, and analyses; preliminary results of autoclave runs, heat effects in coal dissolution-hydrogenation; effect of coal mineral matter upon coal conversion rate; rotating disc experiments; and the continuous reactor. Heat and mass transfer effects in solvent refining of coal are discussed along with theoretical investigation of coal structure and solubility. GRA

N75-22898# Federal Power Commission, Washington, D.C. Bureau of Natural Gas.
A REALISTIC VIEW OF US NATURAL GAS SUPPLY
Dec. 1974 27 p
(PB-238964/1) Avail: NTIS HC $3.75 CSCL 21D

The realities of the U.S. domestic natural gas shortage and the prospects for the future are discussed. GRA

N75-22843 Joint Publications Research Service, Arlington, Va.
REDUCTION OF THE MAXIMUM RAIN RUNOFF MODULES WITH RESPECT TO AREA
Ye. D. Gopchenko *In its* Meteorol. and Hydrology, No. 2, 1975 (JPRS-64670) 1 May 1975 p 79-85 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 2, 1975 p 66-71 (For availability see N75-22834 14-42)

N75-22844 Joint Publications Research Service, Arlington, Va.
DETERMINATION OF THE MAXIMUM SNOW RESERVES BY THE AEROVISUAL OBSERVATIONS IN THE EXPERIMENTAL BASIN OF THE VARZOB RIVER
A. V. Kalachev, V. P. Kanushin, and G. A. Kernosov *In its* Meteorol. and Hydrology, No. 2, 1975 (JPRS-64670) 1 May 1975 p 86-93 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 2, 1975 p 72-77 (For availability see N75-22834 14-42)

N75-22845 Joint Publications Research Service, Arlington, Va.
CONSTRUCTION OF A CLOSED SYSTEM OF ENERGY AND MASS EXCHANGE EQUATIONS FOR CALCULATING THE BIOMASS OF FARM CROPS
O. D. Sirotenko and A. P. Boyko *In its* Meteorol. and Hydrology, No. 2, 1975 (JPRS-64670) 1 May 1975 p 94-106 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 2, 1975 p 78-87 (For availability see N75-22834 14-42)

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N75-22899# Bureau of Mines, Washington, D.C. Div. of Ferrous Metals.
THE 1973 FUEL AND ELECTRICAL ENERGY REQUIREMENTS OF SELECTED MINERAL INDUSTRIES ACTIVITIES
7 May 1975 13 p ref
Avail: NTIS HC $3.25

Results of a nationwide canvass of fuels and electrical energy requirements for mineral extraction and processing are presented. Mines, quarries, pits, mills, coal preparation plants, plants using chemical and solution extraction methods, and smelters were surveyed along with selected mineral processing plants such as cement plants, exfoliating operations, and plants that process primary minerals. Data are reported for 1973 and are compared with total U.S. energy use data published in 1975. Author

N75-22900*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
PHOTOVOLTAIC CELL ARRAY Patent Application
Jon T. Eliason, inventor (to NASA) (Sperry Rand Corp., Huntsville, Ala.) Filed 25 Apr. 1975 9 p Sponsored by NASA
(NASA-Case-MFS-22458-1; US-Patent-Appl-SN-571458) Avail: NTIS HC $3.25 CSCL 10A

A construction technique for making high density solar cell arrays at lowered costs is presented. Closely spaced filaments of silicon are prepared to have a continuous layer-type semiconductor junction formed by creating an internal P-type conductivity region and outer N-type conductivity region. Electrical output connections are made to the P and N layer regions by means of P bus members and N bus members. The filaments of silicon and connecting buses are appropriately woven to form what is

regarded as a solar cell blanket with an effective density of 100 to 1,000 photocells per square inch. NASA

N75-22901*# TRW Systems, Redondo Beach, Calif.
TECHNOLOGY ASSESSMENT OF PORTABLE ENERGY RDT AND P, PHASE 1 Executive Summary Report
J. R. Spraul, comp. 7 Apr. 1975 13 p
(Contract NAS2-8445)
(NASA-CR-137654) Avail: NTIS HC $3.25 CSCL 10A

A technology assessment of transportation energy research, development, technology, and production was undertaken to assess the technical, economic, environmental, sociopolitical issues associated with transportation energy options, and to determine those courses of action impacting aviation and air transportation research and technology. A technology assessment workshop was used to determine the problem statements that would be considered. Study tasks are summarized along with the problem statements. M.J.S.

N75-22902*# TRW Systems, Redondo Beach, Calif.
TECHNOLOGY ASSESSMENT OF PORTABLE ENERGY RDT AND P, PHASE 1 Final Report
J. R. Spraul, comp. 7 Apr. 1975 240 p refs
(Contract NAS2-8445)
(NASA-CR-137653) Avail: NTIS HC $7.50 CSCL 10A

A technological assessment of portable energy research, development, technology, and production was undertaken to assess the technical, economic, environmental, and sociopolitical issues associated with portable energy options. Those courses of action are discussed which would impact aviation and air transportation research and technology. Technology assessment workshops were held to develop problem statements. The eighteen portable energy problem statements are discussed in detail along with each program's objective, approach, task description, and estimates of time and costs. M.J.S.

N75-22903*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SOLAR RESIDENTIAL HEATING AND COOLING SYSTEM DEVELOPMENT TEST PROGRAM
William R. Humphries and Darrell E. Melton Sep. 1974 129 p
(NASA-TM-X-64924) Avail: NTIS HC $5.75 CSCL 10A

A solar heating and cooling system is described, which was installed in a simulated home at Marshall Space Flight Center. Performance data are provided for the checkout and initial operational phase for key subsystems and for the total system. Valuable information was obtained with regard to operation of a solar cooling system during the first summer of operation. Areas where improvements and modifications are required to optimize such a system are discussed. Author

N75-22904*# Kanner (Leo) Associates, Redwood City, Calif.
WIND ENGINES AND WIND INSTALLATIONS
Ye. M. Fateyev Washington NASA Mar. 1975 391 p refs Transl. into ENGLISH of the book "Vetrodvigateli i Vetroustanovki" Moscow, State Publishing House of Agricultural Literature, 1948 p 1-544
(Contract NASw-2481)
(NASA-TT-F-16170) Avail: NTIS HC $10.25 CSCL 10A

A comprehensive theoretical treatment of aerodynamics is presented along with a description of windtunnels, the aerodynamic characteristics of wind engines, towers, and related equipment. Methods of adjustment of wind engines to the wind are described along with several ways of regulating the number of revolutions and the power of wind engines. Wind energy, anemographs, wind engines working with piston and centrifugal pumps, and various agricultural machines are discussed along with windmills and windpower stations. Author

N75-22905# Joint Publications Research Service, Arlington, Va.
TRANSLATIONS ON EASTERN EUROPE: SCIENTIFIC AFFAIRS, NO. 465
16 May 1975 31 p refs Transl. into ENGLISH from Bulgarian and Polish journals
(JPRS-64775) Avail: NTIS HC $3.75

Articles concerning the development of and progress in the various theoretical and applied scientific disciplines and technical fields are presented. The administration, structure, personnel, and research plans of leading East European scientific organizations and institutions, particularly the academies of sciences are included. Author

N75-22906*# General Electric Co., Cincinnati, Ohio.
POTASSIUM TOPPING CYCLES FOR STATIONARY POWER Final Report
R. J. Rossbach Washington NASA Mar. 1975 130 p refs
(Contract NAS3-17354)
(NASA-CR-2518; GESP-741) Avail: NTIS HC $5.75 CSCL 10A

A design study was made of the potassium topping cycle powerplant for central station use. Initially, powerplant performance and economics were studied parametrically by using an existing steam plant as the bottom part of the cycle. Two distinct powerplants were identified which had good thermodynamic and economic performance. Conceptual designs were made of these two powerplants in the 1200 MWe size, and capital and operating costs were estimated for these powerplants. A technical evaluation of these plants was made including conservation of fuel resources, environmental impact, technology status, and degree of development risk. It is concluded that the potassium topping cycle could have a significant impact on national goals such as air and water pollution control and conservation of natural resources because of its higher energy conversion efficiency. Author

N75-22907# California Univ., Berkeley. Lawrence Berkeley Lab.
COLLECTION OF ENERGY COURSES DESIGNED BY PARTICIPANTS OF THE ENERGY INSTITUTE FOR COLLEGE TEACHERS, SUMMER 1974
C. W. Shinners, ed. Aug. 1974 235 p refs
(Contract W-7405-eng-48)
(UCID-3678) Avail: NTIS HC $7.50

In the summer of 1974 the Energy and Environment Division of the Lawrence Berkeley Laboratory conducted a five week institute on energy for college teachers. The first aim of the institute was to provide the teachers with a solid starting-off point from which they could move, on their own, toward a more complete knowledge and understanding of energy matters and, ultimately, to begin teaching their own energy related courses. This was achieved by a series of morning lectures by experts in the field. The second purpose was to stimulate teachers into developing their own course and curricular materials and, in afternoon sharing sessions, to exchange thoughts and ideas on how to teach such courses. A collection of materials is given that represents the output from the afternoon sessions. NSA

N75-22908# Sandia Labs., Albuquerque, N.Mex.
UNTRIGGERED MULTICHANNEL OIL SWITCHING
D. L. Johnson 1974 16 p refs Presented at Intern. Conf. on Energy, Storage, Compression, and Switching, Turin, Italy, 5 Nov. 1974 Sponsored by ERDA
(SAND-74-5590; Conf-741113-2) Avail: NTIS HC $3.25

Experiments were performed on a fast risetime, self-breakdown, multichannel oil switch (for high-voltage accelerators) giving an average switch risetime (10 to 90%) of 5.7 nsec and an average of 12 arc channels per pulse. The apparatus consisted of a 140 kJ Marx generator which charged an intermediate energy store, an SF6 gas switch, and a 44 omega parallel plate Blumlein transmission line with a 120 cm long knife edge switch. Energy was transferred from the intermediate store to the Blumlein through the SF6 switch and a series inductor. The inductor was varied to change the rate of voltage rise on the Blumlein and knife edge switch. Data are presented on the simultaneity of breakdown of two switches, the dependence of switch risetime, and number of arc channels on dV/dt, and on comparisons with empirical oil breakdown formula. Author (NSA)

N75-22909# Atomic Energy Board, Pretoria (South Africa).
BRIEF EXAMINATION OF THE STATUS OF NUCLEAR POWER IN THE REPUBLIC, USING 1974 COSTS
Aug. 1974 17 p refs
(PEL-237E; ISBN-0869605186) Avail: ERDA Depository Libraries HC $4.00

Nuclear power was introduced to the South African grid in

the form of a light-water reactor (LWR) resulting in lower system-averaged costs to the end of the century. An installed nuclear capacity of 12,250 MWe is predicted by the year 2000. The economic date for reliable full-power operation for the first plant is computed to be 1983, with the second following a year later, and a third in 1987. Predictions of the installed nuclear capacity are sensitive to future fuel costs, but insensitive to future interest rates. Emphasis is placed on middle-term planning for the foreseeable future. Nuclear power is competitive only if the price of coal escalates at a rate of 4 per cent per annum and nuclear fuel costs remain as predicted. The introduction of nuclear power results in a significant saving in the amount of coal used for power generation at the expense of only a 1 per cent depletion of our low-cost uranium reserves.
Author (NSA)

N75-22910# European Space Research Organization, Paris (France).
ON THE APPLICATION OF HYDROGEN AS A FUEL FOR AUTOMOTIVE VEHICLES
A. Gann Feb. 1975 18 p refs Transl. into ENGLISH of "Ueber die Verwendung von Wasserstoff als Triebstoff fuer Automobile" DFVLR, Porz, West Ger. Report DLR-Mitt-73-22, 27 Apr. 1973 Original German report available from DFVLR, Porz, West Ger. 8.90 DM
(ESRO-TT-132; DLR-Mitt-73-22) Avail: NTIS HC $3.25

The advantages and disadvantages of storing the gaseous, liquid, and metal hydride form of hydrogen for future hydrogen-air fueled automobiles are discussed. Safety problems are not taken into account. ESRO

N75-22911# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THERMAL DIAGRAMS OF THERMOELECTRICAL DEVICES
G. K. Kotyrlo and G. M. Shchegolev 1 Oct. 1974 126 p refs Transl. into ENGLISH of the book "Teplovye Skhemy Termo-Elektricheskikh Ustroistv" Kiev, 1973 p 1-107
(FTD Proj. T74-04-03)
(AD-787420; FTD-HC-23-1567-74) Avail: NTIS CSCL 10/2

A classification of the thermal configurations of thermoelectric, electrical generating, and cooling-heating devices is given. Principal attention is given to a description of new thermal schemes of thermoelectric devices of such types. GRA

N75-22912# Harvard Univ., Cambridge, Mass. Div. of Engineering and Applied Physics.
CONTINUOUS SILICON SOLAR CELLS Quarterly Progress Report, 1 Jul. - 30 Sep. 1974
B. Chalmers, T. Surek, and J. C. Swartz (Tyco Labs., Inc., Waltham, Mass.) Oct. 1974 50 p refs
(Grant NSF GI-37067)
(PB-238542/5; NSF/RA/N-74-139; NSF/RANN/SE/GI-37067X/PR/74/3; QPR-3) Avail: NTIS HC $3.75 CSCL 10B

Research progress on silicon ribbon growth by the Edge defined Film fed Growth technique is described. Analysis of radially frozen zones in thin silicon wafers is made to determine the conditions for steady-state cross-sectional growth, spreading and tapering. Analogue experiments designed to test meniscus shapes in EFG are described. Results of silicon ribbon growth from fused silica dies are presented. Recent publications which summarize the theoretical and experimental efforts, and describe the effects of ribbon crystallinity on solar cell performance are appended to this report. GRA

N75-22913# Defence Research Establishment Ottawa (Ontario).
NICKEL/CADMIUM AIRCRAFT BATTERIES: FLOAT CHARGE TEST
Keiva Feldman and William A. LePage Oct. 1974 30 p refs
(AD-A002767; DREO-R-705) Avail: NTIS CSCL 10/3

Manufacturers have been unable to supply nickel/cadmium aircraft batteries which could pass the float charge test specified in the Canadian Forces Specification CF-B-70. Battery behavior under the conditions of the test has therefore been investigated. The batteries tested started into thermal runaway because oxygen generated at the nickel plate reached the cadmium plate and reacted exothermally with it. Recommendations are made for battery improvement, with respect to type of separator material and how it should be wrapped around the plates. Suggestions for modification of the float charge test are also made, so that it can be more useful in identifying those batteries which are best able to withstand floating at high temperatures. Suggestions for improved screening of defective cells and for limiting the overcharge on board the aircraft are made. GRA

N75-22914# National Bureau of Standards, Washington, D.C. Center for Building Technology.
RETROFITTING EXISTING HOUSING FOR ENERGY CONSERVATION: AN ECONOMIC ANALYSIS Final Report
Stephen R. Peterson Dec. 1974 78 p refs Prepared in cooperation with Federal Energy Administration, Washington, D. C.
(COM-75-50049/6; NBS-BSS-64) Avail: NTIS MF $2.25; SOD HC as C13.29/2:64 CSCL 13M

The study examines the economic aspects of energy conservation techniques suitable for retrofitting into existing housing, including insulation, storm windows and doors, and weather stripping. The objective is to determine a combination of techniques which will maximize net dollar savings in life-cycle operating costs for heating and cooling operations in existing homes, subject to specific climate conditions, fuel costs, and retrofitting costs. Microeconomic marginal analysis indicates that such a combination must be balanced so that the ratio of savings to cost is equal at the margin for each technique. GRA

N75-22915# Martin Marietta Corp., Denver, Colo.
SOLAR POWER SYSTEM AND COMPONENT RESEARCH PROGRAM Quarterly Report, 15 Jan. - 15 Apr. 1974
Floyd A. Blake Apr. 1974 133 p refs
(Grant NSF GI-41305)
(PB-238642/3; MCR-74-141(1); NSF/RA/N-74-103) Avail: NTIS HC $15.75 CSCL 10B

Progress is reported on system definition and performance analysis of a 100-MWe solar power system; user application analyses of direct hydroelectric integration, tie-line integration, and industrial augmentation systems; and meteorological analyses to model direct vs total insolation data. Component design studies concentrate on the boiler and superheater steam generator equipment. GRA

N75-22916# Boston Coll., Chestnut Hill, Mass. Dept. of Physics.
COLUMNAR SILICON FILM SOLAR CELLS FOR TERRESTRIAL APPLICATIONS Quarterly Progress Report, 1 Jul. - 30 Sep. 1974
P. H. Fang 20 Oct. 1974 31 p refs
(Grant NSF GI-34975)
(PB-238534/2; NSF/RANN/SE/GI-34975/PR/74/3; NSF/RA/N-74-140) Avail: NTIS HC $3.75 CSCL 10B

Research on the development of a new solar cell structure to convert solar energy into electrical energy for terrestrial application is presented. Crystal growth is investigated, especially from the point of view of the role played by the aluminum surface and a possible extension of this mechanism to other types of surfaces for crystal growth. Doping of the silicon film to obtain a specific conductivity type principally by aluminum for a p-type silicon film, and formation of a p-n junction by the growth of a superimposed silicon layer with conductivity type opposite to that of the base layer are discussed. Phosphorus doped silicon layers on p-type silicon single crystals were investigated. GRA

N75-22917# Energy Research Corp., Bethel, Conn.
ELECTROLYTE FOR HYDROCARBON AIR FUEL CELLS Final Report
Bernard S. Baker Feb. 1975 23 p refs
(Contract DAAK02-73-C-0084; DA Proj. 1T0-611023-A-34A)
(AD-A007220; ERC-2597F) Avail: NTIS CSCL 10/3

In this final report early experiments on a variety of organic acids used as fuel cell electrolytes are summarized. The selection of tetrafluoroethanedisulfonic acid (TFEDSA) is reviewed and an improved synthesis for the acid is presented. Fuel cell data using high surface area polytetrafluoroethylene bonded platinum black electrodes is given for phosphoric acid, organic acid-phosphoric

acid mixtures and TFEDSA electrolytes. For the latter a variety of paraffinic fuels ranging from ethane to pentane have been explored and polarization data is presented. Endurance data extending to 400 hours is given for propane and butane fuels. Levels of performance are similar to results obtained with direct propane oxidation in phosphoric acid. GRA

N75-22918# Aerojet Liquid Rocket Co., Sacramento, Calif.
DEVELOPMENT AND EVALUATION OF A STIRLING-CYCLE ENERGY CONVERSION SYSTEM Annual Report, May 1973 - Jul. 1974
S. Andrus, R. J. Faeser, J. Moise, L. C. Hoffman, and M. I. Rudnicki Aug. 1974 113 p refs
(Contract PHS-73-2930)
(PB-239086/2; ALRC-9280-74-11-10; NIH/NHLI-73-2930-1) Avail: NTIS HC $3.75 CSCL 10B

The Stirling-Cycle engine is designed to power implantable heart-assist and total-heart-replacement systems. Heat is provided by a PU-238 radioisotope capsule. Program activity during the report period included development and in vivo testing of the Heart Assist System including the PAC-4 actuator and the MK V engine; design of an advanced actuator, PAC-5; and design, fabrication and testing of the THA-1 Total Heart Actuator. GRA

N75-22919# National Center for Energy Management and Power, Philadelphia, Pa.
TECHNOLOGY FOR THE CONVERSION OF SOLAR ENERGY TO FUEL GAS Quarterly Report
30 Apr. 1973 25 p
(Grants NSF GI-27976; NSF GI-34991)
(PB-238545/8; NSF/RA/N-73-078;
NSF/RANN/SE/GI-27976/73/1) Avail: NTIS HC $3.25 CSCL 07A

The development of increased laboratory-scale digester capacity is discussed. Active and stably operating digester cultures are established to allow initiation of the experimental effort. Emphasis is placed on the achievement of two-stage digestion. GRA

N75-22920# Mallory (P. R.) and Co., Inc., Burlington, Mass. Lab. for Physical Science.
SEALED PRIMARY LITHIUM-INORGANIC ELECTROLYTE CELL Quarterly Report, 1 Sep. - 30 Nov. 1974
A. N. Dey Mar. 1975 42 p refs
(Contract DAAB07-74-C-0109; DA Proj. 1S7-62705-H-94)
(AD-A006647; ECOM-74-0109-3) Avail: NTIS CSCL 10/3

The purpose of this program is to develop and characterize the lithium-inorganic electrolyte system comprising a Li anode, a carbon cathode, a LiAlCl4 electrolyte salt, and a SOCl2 solvent cum depolarizer. The basic system has been described in the literature. It has been shown earlier that although the system is capable of delivering high energy densities, it exhibits a voltage delay on discharge after storage at high temperature due to the formation of a LiCl passivating film on Li. The program is divided into two tasks: Task I involves the component capability and design, and Task II involves the construction of sealed battery cell prototypes. During the third quarter the authors continued the construction of the hermetic Li/SOCl2 D cells for evaluation, and obtained some storage and low temperature performance data. They also monitored the temperature rise of the D cells on shorting. GRA

N75-22921# EIC, Inc., Newton, Mass.
PASSIVE-LITHIUM SECONDARY BATTERIES Final Technical Report, 1 Jan. 1974 - 31 Jan. 1975
R. David Rauh and S. Barry Brummer Feb. 1975 8 p refs
(Contract N00014-74-C-0205; ARPA Order 2611; NR Proj. 359-571)
(AD-A006748; C-404-F) Avail: NTIS CSCL 10/3

The feasibility of an ambient temperature secondary battery system is examined with emphasis on the rechargeable lithium electrode. The effect of electrolyte composition upon the lithium cycling efficiency, upon the cycled life, and upon the corrosion rate of the electrodeposited material is studied in the following electrolytic solvents: propylene carbonate, methyl acetate, and methyl pivalate. Various additives are found to improve the behavior of the lithium electrode, and are considered as potential 'precursors'. GRA

N75-22922# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THERMOELECTRIC COOLERS AND GENERATORS
I. V. Zorin and Z. Ya. Zorina 21 Jan. 1975 214 p refs
Transl. into ENGLISH from the monograph "Termoelektricheskie Kholodilniki i Generatorii" Leningrad, 1973 p 1-36
(AD-A007174; FTD-HC-23-2126-74) Avail: NTIS CSCL 13/1

The book discusses questions concerning the theory, design, rating, and use of thermoelectric coolers and generators. It shows the influence of the special features of thermoelectric processes in combination with electrotechnical and heat engineering processes. Thirty alignment charts are provided to facilitate calculations. Many examples of a design solution for multi-purpose thermoelectric devices and their subassemblies are considered. GRA

N75-22923# EIC, Inc., Newton, Mass.
THE EFFECT OF ADDITIVES ON LITHIUM CYCLING IN PROPYLENE CARBONATE Final Technical Report, 1 Jan. 1974 - 31 Jan. 1975
R. Rauh and S. Barry Brummer Feb. 1975 31 p refs
(Contract N00014-74-C-0205; ARPA Order 2611; NR Proj. 359-571)
(AD-A006571; C-404-1) Avail: NTIS CSCL 10/3

Deposition and discharge of lithium on an inert (nickel) substrate in 1M $LiClO_4$/propylene carbonate (PC) has been studied as a function of plating and stripping currents, cycle number, and electrolyte composition. Water (~1200 ppm), nitromethane, and SO_2 were found to enhance the cycling efficiency, which was relatively low in the dry electrolyte without additives. In all cases, marked deterioration in efficiency was noted after 10 to 20 repeated cycles corrosion was investigated. A mechanism of loss of efficiency during lithium cycling and also on open circuit stand has been formulated. GRA

N75-22924# GTE Labs., Inc., Waltham, Mass.
SEALED LITHIUM INORGANIC ELECTROLYTE CELL
N. Marincic and A. Lombardi Feb. 1975 72 p refs
(Contract DAAB07-74-C-0108; DA Proj. 1S7-62705-AH-94)
(AD-A006810; ECOM-74-0108-3; QR-3) Avail: NTIS CSCL 10/3

A satisfactory sealing procedure is reported for the primary D size cells. Results are reported for the tests of fresh cells under constant current discharge conditions at several selected discharge temperatures. No voltage delay has been observed on the fresh cells within a week at room temperature. The analysis is reported of the thermal conditions of cells discharged at extreme high rate. The maximum safe discharge rate was calculated from the net heating rate data. A good agreement was observed between the predicted and the realized behavior of cells discharged with extreme high rates. A good capacity-rate behavior has been observed of the fresh cells and also of the cells stored for one month at room temperature prior to the discharge test. GRA

N75-22925# National Research Council, Washington, D.C.
EVALUATING INTEGRATED UTILITY SYSTEMS Final Report
Sep. 1974 125 p refs
(Contract HUD-H-1875)
(PB-238765/2) Avail: NTIS HC $5.25 CSCL 13A

Various concepts developed to provide utility systems designed to serve the needs of residential complexes ranging for from 300 to 1,000 dwelling units are reviewed and evaluated. It is found that the commercial hardware is available to achieve separate objectives of an integrated system but no system that effectively integrates these functions has been designed. GRA

N75-22926# Wisconsin Univ., Madison. Solar Energy Lab.
MODELING OF SOLAR HEATING AND AIR CONDITIONING Semiannual Progress Report, 1 Feb. - 31 Oct. 1974
John A. Duffie and William A. Beckman 31 Oct. 1974 87 p refs
(Grant NSF GI-40457)
(PB-239189/4; NSF/RANN/SE/GI-34029/PR/74/2;
NSF/RA/N-74-170) Avail: NTIS HC $4.75 CSCL 13A

The basic objective of this research is to develop a general and easy to use method for simulating a variety of solar energy

thermal systems. The result of this study has been TRNSYS, a method for transient systems simulation. The TRNSYS program is described, from the point of view of a user. GRA

N75-22927# Hudson Inst., Inc., Croton-on-Hudson, N.Y.
A STUDY OF ENERGY SYSTEMS COMMAND, CONTROL AND COMMUNICATION FOR ENERGY CRISIS MANAGEMENT
Nicholas Fedoruk, Uzi Arda, Herman Kahn, Michael C. Macrakis, and Barry J. Mernoff Oct. 1974 142 p refs Sponsored by ERDA
(PB-239290/0; HI-2132-RR; NSF/RA/N-74-164) Avail: NTIS HC $5.75 CSCL 10A

An energy crisis management system which provides contingency plans and capabilities for far-fetched events whose impact could be very significant for the nation is considered. GRA

N75-22928# Florida Univ., Gainesville. Dept. of Mechanical Engineering.
FORMULATION OF A DATA BASE FOR THE ANALYSIS, EVALUATION AND SELECTION OF A LOW TEMPERATURE SOLAR POWERED AIR CONDITIONING SYSTEM Final Summary Report
E. A. Farber, C. A. Morrison, and H. A. Ingley 31 Jul. 1974 275 p refs
(Grant NSF GI-39323)
(PB-238683/7; NSF/RANN/SE/GI-39323/FR/74/2; NSF/RA/N-74-0-67) Avail: NTIS HC $8.50 CSCL 13A

Various methods by which solar energy can be used for comfort cooling are presented. Data necessary for system analysis and computer analysis of the best methods are included. The ammonia-water absorption system was selected as the best present system with the greatest promise of ultimate success for solar air conditioning and refrigeration. A study of the state-of-the-art for both water- and air-cooled systems is presented together with a study of properties of refrigerants and absorber combinations, a computer performance analysis on two systems showing promise, and recommendations based upon the analyses. GRA

N75-22929# Dynatech Corp., Cambridge, Mass.
FUEL GAS PRODUCTION FROM SOLID WASTE Supplemental Report, 1 Jul. 1973 - 30 Jun. 1974
Charles L. Cooney, E. E. Lindsey, R. S. Kirk, and S. Oyewole 31 Jul. 1974 77 p refs
(Contract NSF C-827)
(PB-238563/1; Dynatech-1213; NSF/RA/N-74-112) Avail: NTIS HC $4.75 CSCL 21D

The advantages of thermophilic digestion over the traditional mesophilic digestion are discussed. It is concluded that anaerobic thermophilic digestion of cellulose waste is a feasible operation for the production of fual gas. The effects of residence time, recycle, and temperature on the extent of solid waste degradation, biological mass formed, and quantity and quality of gas produced are discussed. Recommendations for future research are presented. Part 2 contains three sections: Kinetic Studies on Anaerobic Digestion of Solid Waste; Feasibility of an On-line Instrument for Measuring Anaerobic Digestion Microbial Activity; and Development of Process Techniques for Microorganisms Separation. GRA

N75-22930# Martin Marietta Corp., Denver, Colo.
SOLAR POWER SYSTEM AND COMPONENT RESEARCH PROGRAM Final Report, 15 Jan. - 15 Nov. 1974
F. A. Blake and J. D. Walton 31 Jan. 1975 463 p refs
(Grant NSF AER-74-07570)
(PB-239185/2; MCR-75-9; NSF/RA/N-75-002) Avail: NTIS HC $11.50 CSCL 10B

System analysis and component design for a 100-MWe solar energy conversion power system are presented. The component design phase is concentrated on the boiler/superheater steam generation equipment. Results from the user application analyses, meteorological analysis, economic analysis, and boiler/superheater component design are included. GRA

N75-22931# EIC, Inc., Newton, Mass.
THE EFFECT OF ADDITIVES IN LITHIUM CYCLING IN METHYL ACETATE Final Technical Report, 1 Jan. 1974 - 31 Jan. 1975
R. David Rauh and S. Barry Brummer Feb. 1975 22 p refs
(Contract N00014-74-C-0205; ARPA Order 2611; NR Proj. 359-571)
(AD-A006572; C-404-2) Avail: NTIS CSCL 10/3

Methyl acetate (MA) was examined as a solvent for use in nonaqueous secondary lithium batteries. The efficiency of cycling lithium on nickel in MA/1M $LiClO_4$ containing less than 10 ppm H_2O was less than 10%. Addition of nitromethane (NM), SO_2 or small amounts of H_2O improved the efficiency markedly. Compared to propylene carbonate (PC), MA plus SO_2 or NM afforded more repeated cycles before failure of the working electrode. Unlike PC, the open circuit corrosion rate of electrodeposited lithium in MA is decreased in the presence of additives. The differences in behavior between PC and MA are attributed to the greater solubility of the MA-lithium reaction products, allowing greater opportunity for buildup of additive-induced conductive films on the metallic deposit. GRA

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N75-22932 Drexel Univ., Philadelphia, Pa.
METAL RELEASES DURING THE INCINERATION OF MUNICIPAL REFUSE Ph.D. Thesis
Joel Reed Bender 1975 156 p
Avail: Univ. Microfilms Order No. 75-6116

Municipal refuse and the byproducts of incineration for aluminum, chromium, copper, iron, lead, tin, and zinc were sampled and analyzed. A mass balance of the selected metals is presented. Statistical characteristics of the samples obtained throughout the incineration process are examined to determine the variability. The selected metals are categorized as metals released with the particulate matter, collected flyash, quench water, clarifier water, and residue. The environmental burden of the metal releases is examined by determining the amount of metal which enters air, water, and land resources. Dissert. Abstr.

N75-22933 Northwestern Univ., Evanston, Ill.
POLLUTANT FORMATION IN TURBULENT FLAMES Ph.D. Thesis
Gordon Foster Robinson 1974 501 p
Avail: Univ. Microfilms Order No. 75-7977

The expanding importance of the gas turbine in the utilization of fossil fuels is recognized, and its air polluting characteristics are reviewed. The role of turbulence in pollutant formation is investigated. Measurements of the cold-flow turbulence characteristics downstream of three perforated-plate flame holders, of varying solidity ratio, are made. In the combustion experiment, measurements of the concentration distribution of CO, NOx, HC, and CO_2, downstream of the same flame holders, are made. The combustor configuration is tubular and constant, and the fuel is premixed, prevaporized propane. The experimental results are modeled by a one-dimensional analysis in which transport phenomena are neglected, and, more successfully, by a quasi-one-dimensional analysis in which recirculation zones and turbulent transport are included. Dissert. Abstr.

N75-22934 Oklahoma State Univ., Stillwater.
ECOLOGICAL STABILITY: A SYSTEM THEORY VIEWPOINT Ph.D. Thesis
Robert Wayne Rutledge 1974 99 p
Avail: Univ. Microfilms Order No. 75-8880

A definition was presented and a measure of ecological stability was developed using choice of pathways for energy flow. The measure was tested as an objective function of a control problem for a stream community and as an indicator of the effect of environmental stress in a shortgrass prairie. A total ecosystem sensitivity measure was developed for the ecosystem model and was shown to be equivalent to the ecological stability measure. The stability measure proved to be a viable objective function for an ecological control problem. Results are consistent with those obtained from the control problem experiment on

the effect of environmental stress. The conjecture was made that ecosystems possess maximum stability when environmental conditions are most harsh. This conjecture appears to be consistent with past observations. Dissert. Abstr.

N75-22935 Michigan Univ., Ann Arbor.
WATER QUALITY INDICES-CONSTRUCTION AND ANALYSIS Ph.D. Thesis
Jurate Maciunas Landwehr 1974 294 p
Avail: Univ. Microfilms Order No. 75-10212

Several existing as well as some newly proposed indices were investigated for their ability to describe the quality of a water sample in accordance with the consensus of a group of experts. Although several water quality indices performed reasonably well, a newly proposed unweighted multiplicative index was proven to be better than both previously existing and newly formulated indices. It was shown that different groups of experts judged water quality in a similar manner, and no regional biases could be distinguished. The influence on the indices studied here of both measurement errors and variations in the opinion of the experts on how quality varied with parameter concentration, was investigated in detail. Relations between water quality indices and biological diversity indices were explored for a limited data base. Dissert. Abstr.

N75-22936# Imperial Coll. of Science and Technology, London (England). Dept. of Mechanical Engineering.
HEAT AND MASS TRANSFER IN THE ENVIRONMENT
D. P. Spalding Dec. 1973 34 p refs
(HTS/73/56) Avail: NTIS HC $3.75

The chemical and thermal pollution of the atmosphere and natural waters which occur by processes of flow and mixing, (usually turbulent), in complex two- and three-dimensional circumstances are discussed. Buoyancy, radiation, Coriolis and other effects preclude study by way of cheap small-scale models. Recent advances in computer methods of solving partial differential equations, and mathematical representations of turbulence, permit numerical prediction of pollution processes. Author

N75-22937*# National Aeronautics and Space Administration. National Space Technology Labs., Bay Saint Louis, Miss.
WATER HYACINTHS AND ALLIGATOR WEEDS FOR REMOVAL OF LEAD AND MERCURY FROM POLLUTED WATERS
B. C. Wolverton and R. C. McDonald 11 Apr. 1975 14 p refs
(NASA-TM-X-72723) Avail: NTIS HC $3.25 CSCL 13B

Removal of lead and mercury by water hyacinths (Eichhornia crassipes) (Mart.) Solms and alligator weeds (Alternanthera philoxeroides) (Mart.) Griesb. was investigated. Water hyacinths demonstrated the ability to remove 0.176 mg of lead and 0.150 mg of mercury per gram of dry plant material from distilled water and river water in a 24-hour period. One acre of water hyacinths is potentially capable of removing 105.6 grams of lead and 90.0 grams of mercury per day. Alligator weeds removed 0.101 mg of lead per gram of dry plant material in a 24-hour period. This same plant also demonstrated the ability to remove a minimum of 0.153 mg of mercury per gram of dry plant material in a six hour period. Author

N75-22938*# National Aeronautics and Space Administration. National Space Technology Labs., Bay Saint Louis, Miss.
APPLICATION OF VASCULAR AQUATIC PLANTS FOR POLLUTION REMOVAL, ENERGY AND FOOD PRODUCTION IN A BIOLOGICAL SYSTEM
B. C. Wolverton, R. M. Barlow, and R. C. McDonald 12 May 1975 17 p refs
(NASA-TM-X-72726) Avail: NTIS HC $3.25 CSCL 13B

Vascular aquatic plants such as water hyacinths (Eichhornia crassipes) (Mart.) Solms and alligator weeds (Alternanthera philoxeroides) (Mart.) Griesb., when utilized in a controlled biological system (including a regular program of harvesting to achieve maximum growth and pollution removal efficiency), may represent a remarkably efficient and inexpensive filtration and disposal system for toxic materials and sewage released into waters near urban and industrial areas. The harvested and processed plant materials are sources of energy, fertilizer, animal feed, and human food. Such a system has industrial, municipal, and agricultural applications. Author

N75-22939*# Old Dominion Univ. Research Foundation, Norfolk, Va.
A THEORETICAL/EXPERIMENTAL PROGRAM TO DEVELOP ACTIVE OPTICAL POLLUTION SENSORS, PART 2 Final Report
Sherman K. Poultney May 1975 17 p refs
(Grant NGR-47-003-087)
(NASA-CR-142727) Avail: NTIS HC $3.25 CSCL 13B

Progress is reported on experimental investigations of Lidar and the application of Lidar to environmental and atmospheric science. Specifically the following programs are considered: calibration and application of the LaRC 48-inch Lidar; efficient and certain detection of SO2 and other gases in the calibration tank using the Raman Stack Monitor Lidar; the potential of Lidar remote sensing from the space shuttle; and the planning and mounting of efforts to realize the promise of backscatter differential absorption Lidar. J.M.S.

N75-22940# Environmental Protection Agency, Research Triangle Park, N.C. Office of Air Quality Planning and Standards.
COMPILATION OF AIR POLLUTANT EMISSION FACTORS, SUPPLEMENT NO. 4
David S. Kircher and Charles C. Masser Jan. 1975 69 p refs
(AP-42) Avail: NTIS HC $4.25

Revised and updated emission factors for various categories of internal combustion engine sources and for miscellaneous sources are presented. Author

N75-22941*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
NOISE DATA FROM TESTS OF A 1.83 METER (6-FT-) DIAMETER VARIABLE-PITCH 1.2-PRESSURE-RATIO FAN (QF-9)
Frederick W. Glaser, Joseph A. Wazyniak, and Robert Friedman Washington Mar. 1975 185 p refs
(NASA-TM-X-3187; E-8102) Avail: NTIS HC $7.00 CSCL 20A

Acoustic and aerodynamic data for a 1.83-meter (6-ft.) diameter fan suitable for a quiet engine for short-takeoff-and-landing (STOL) aircraft are documented. The QF-9 rotor blades had an adjustable pitch feature which provided a means for testing at several rotor blade setting angles, including one for reverse thrust. The fan stage incorporated features for low noise. Far-field noise around the fan was measured without acoustic suppression over a range of operating conditions for six different rotor blade setting angles in the forward thrust configuration, and for one in the reverse configuration. Complete results of one-third-octave band analysis of the data are presented in tabular form. Also included are power spectra, data referred to the source, and sideline perceived noise levels. Author

N75-22942# California Univ., Berkeley. Lawrence Berkeley Lab.
VULNERABILITY OF ECOSYSTEMS DISTURBED BY MAN
J. Harte and D. Levy Sep. 1974 32 p refs Presented at the 1st Intern. Congr. of Ecology, The Hague, 8 Sep. 1974
(Contract W-7405-eng-48)
(LBL-3214; Conf-740912-2) HC $3.75

The Liapunov stability theory was applied to mathematical models of energy and nutrient flow in ecosystems. The domain of stability under noninfinitesimal perturbations is discussed and significant differences are pointed out between models with and without detritus-decomposer feedback loops. Possible practical implications in predicting the effects of human activities on the environment are suggested. NSA

N75-22943# Swedish Water and Air Pollution Research Lab., Goeteborg.
DETERMINATION OF MASS OF FILTER-COLLECTED AIR-BORNE PARTICLES BY MEASURING ABSORPTION OF BETA RADIATION
A. Jansson and P. Grennfelt May 1974 22 p refs
(NP-20233) Avail: ERDA Depository Libraries HC $4.25

The use of beta-radiation absorption measurements for

determination of the total mass of filter-collected air-borne particles was investigated for small surface densities. The technique was applied to various types of test dust and atmospheric dust. All the dust showed a dependence between the beta absorption and the surface density of the particles on the filters that differed from the exponential curve which was obtained when using thin foils. The absorption did not only depend on the surface density of the filter-collected particles but also of characteristics of the collected particulate matter. The beta-absorption method showed a standard deviation of about 13 microgram/sq cm and the lowest allowable amount of particles collected on a filter was set to 50 microgram/sq cm. With a filtration area of 1.54 sq cm and a sampled volume of 8 cu cm the method enables concentrations of particulate matter down to about 10 microgram/cu cm to be measured. Author (NSA)

N75-22944# Commission of the European Communities, Ispra (Italy).
METEOROLOGICAL TRACERS IN REGIONAL PLANNING
K. H. Mueller 1974 33 p refs In GERMAN
(EUR-5217d) Avail: ERDA Depository Libraries HC $4.75

Atmospheric tracers are used as indicators to study both the ventilation of an urban region and its dispersion meteorology for air pollutants. A correlation analysis is applied to the space-time dependent tracer concentrations to give transfer functions, the structure and characteristic parameters of which describe the meteorological and topographical situation of the urban region and its surroundings in an integral manner. An automatic air sampling system is developed. Author (NSA)

N75-22945# Battelle Pacific Northwest Labs., Richland, Wash.
WASHOUT COEFFICIENTS FOR POLYDISPERSE AEROSOLS
M. Terry Dana and J. M. Hales 1974 20 p refs Presented at the Precipitation Scavenging Conf., Champaign, Ill., 13 Oct. 1974
(Contract AT(45-1)-1830)
(BNWL-SA-5080; Conf-741003-8) Avail: NTIS HC $3.25

Washout properties of irreversibly scavenged atmospheric pollutants necessary for environmental impact analyses are investigated. It is concluded that washout coefficients of any order for polydisperse aerosols depend upon the characteristics of the particle size spectrum as well as the raindrop spectrum and the collection efficiencies. The collection efficiencies are assumed to be of a certain mathematical form. Author (NSA)

N75-22946# Atomic Energy Commission, Washington, D.C.
PLUTONIUM INFORMATION MEETING
Dec. 1974 108 p refs Conf. held at Los Alamos, N. Mex., 4-5 Jan. 1974
(Conf-740115) Avail: NTIS HC $5.25

Plutonium isotopes injected into the stratosphere by atmospheric nuclear weapons tests are discussed as the primary source of information on plutonium atmospheric behavior. The reentry and burnup of the SNAP-9A power generator is discussed as another major source. The factors that modify Pu behavior in terms of concentration and/or discrimination within ecosystem components are outlined. Results indicated that the ratio of 239 Pu to 90Sr produced by nuclear weapons testing in the atmosphere essentially remained constant. Interception of atmospheric Pu by vegetation is discussed as one means of biological transport that depends on local fallout phenomena and physiognomy of the vegetation. The uptake and transport of Pu by wild animals also occurs. Soil characteristics are shown to have an important influence upon Pu movement. NSA

N75-22947# California Univ., Livermore. Lawrence Livermore Lab.
OBSERVATIONS OF DUST FLUX IN THE SURFACE BOUNDARY LAYER FOR STEADY AND NONSTEADY CASES
J. H. Shinn, N. C. Kennedy, J. S. Koval, B. R. Clegg, and W. M. Porch 20 Sep. 1974 23 p refs
(UCRL-75832) Avail: NTIS HC $3.25

Dust flux measurements by the eddy-correlation method are compared for several cases of strong steady winds and intermittent gust fronts. Observations of mass concentrations, mass flux, and particle size distributions during a dust storm in Plains, Texas are shown to contrast with observations at the GMX location of the Nevada Test Site. The calculation of flux for analysis and evaluation of health hazards due to resuspension of respirable particulates is simplified by parameterization to friction velocity and erodibility. The dust concentration is shown to vary with the sixth power of the wind speed. From the limited data available, a parametric vertical dust flux model is proposed which is general for the types of dry, unvegetated sites reported. Author (NSA)

N75-22948# California State Air Resources Board, Sacramento.
METEOROLOGICAL PARAMETERS FOR ESTIMATING THE POTENTIAL FOR AIR POLLUTION IN CALIFORNIA
Jul. 1974 70 p refs
(Contract HUD-CPA-CA-1032)
(PB-238427/9) Avail: NTIS HC $4.25 CSCL 13B

The meteorological processes influencing the dispersion of air pollutants are discussed. The Holzworth technique for quantifying the dispersion capacity of the atmosphere is presented and results for California are discussed. The Holzworth technique is applied to an expanded data base for California and these results are presented in graphical and tabular formats. The parameters calculated and quantified are air pollution potential, morning wind speed, morning mixing heights, and percentile groupings of air pollution potential. GRA

N75-22949# EcoSystems, Inc., McLean, Va.
AN IMPACT ASSESSMENT OF THREE FEDERAL REGULATIONS Final Report
Lawrence Boesch, George Kelly, Stephen Noren, Kurts Stehling, and Robert Strieter Oct. 1974 169 p refs
(Contract NSF C-823)
(PB-238641/5) Avail: NTIS HC $6.25 CSCL 13B

This is the final report of study examining the impact of Federal regulatory actions upon regulated industry, with particular emphasis being given to those impacts which affect technological innovation in the industry. The underlying objective of the study was to identify possible incentive actions available to the Federal government which might magnify favorable effects or reduce adverse impacts. The study examined the origins, intent, mechanisms, and effects of the specific regulations on automotive emissions, SO2 emissions from electric power generating plants, and new drugs. Discussions were held with a broad range of experts in industry, industrial associations, government and academic community. GRA

N75-22950# National Environmental Research Center, Research Triangle Park, N.C. Quality Assurance and Environmental Monitoring Lab.
GUIDELINES FOR DETERMINING PERFORMANCE CHARACTERISTICS OF AUTOMATED METHODS FOR MEASURING NITROGEN DIOXIDE AND HYDROCARBONS CORRECTED FOR METHANE IN AMBIENT AIR
Nov. 1974 47 p refs
(PB-238092/1; EPA-650/4-74-018) Avail: NTIS HC $3.75 CSCL 14B

Recommended performance specification and test procedures are given for range, noise, lower detectable limit, interference equivalent, zero drift, span drift, lag time, rise time, fall time, and precision for automated methods for measuring nitrogen dioxide and hydrocarbons corrected for methane. These specifications and test procedures are intended for use as guidelines to assist instrument manufacturers and instrument users to determine performance characteristics for continuous air monitoring analyzers. GRA

N75-22951# National Bureau of Standards, Washington, D.C.
DEVELOPMENT OF A SOLID SORPTION TUBE FOR SAMPLING HYDROGEN FLUORIDE IN THE WORK ATMOSPHERE Final Report
James Wing and John K. Taylor Oct. 1974 46 p refs Prepared for Natl. Inst. for Occupational Safety and Health, Cincinnati
(COM-75-10127/9; NBSIR-74-581) Avail: NTIS HC $3.75 CSCL 06J

The efficiencies of several solid substances in a sorption tube for collecting trace quantities of hydrogen fluoride gas in work atmosphere have been evaluated. Reagent-grade sodium acetate crystals proved to be a very efficient sorbent for hydrogen fluoride. Its solubility in water and pH buffer properties are highly

advantageous for subsequent fluoride determination by the ion selective electrode. Experimental results are presented for collection efficiencies of hydrogen fluoride gas at several concentration levels, flow rates, and collection times, the effects of elevated temperatures and humidity, and also break-through, bleed-out, storage and shipment studies. Specifications for construction of the sorption tubes are also given. GRA

N75-22952# Vermont Univ., Burlington. Water Resources Research Center.

OZONE AND CHLORINE DEGRADATION OF WASTE WATER POLLUTANTS Completion Report, 1 Jul. 1973 - 30 Jun. 1974

John Stoveken Jun. 1974 8 p refs
(Contract DI-14-31-1-4046)
(PB-238365/1; OWRR-A-017-VT(1)) Avail: NTIS HC $3.25 CSCL 13B

Both ozone and chlorine concentrations were measured using the orthotolidine-manganese sulfate method; concentrations were measured spectrophotometrically, and thin-layer and gas-liquid chromatography were used to evaluate oxidation products and concentrations. Both chlorine and ozone are effective but vary greatly in their activity and specific reactions. Chlorine at 3 times conc. was not effecive against amino acid proline, p. dioxane, diphenylamine, guanidine, n-hexane, phenol, and pyridine. Ozone was very destructive to the fatty acids levulinic, linoleic and oleic acids. GRA

N75-22953# Ocean Systems, Inc., Reston, Va.

AT-SEA TESTING OF A HIGH SEAS OIL RECOVERY SYSTEM Final Report, 30 Jul. - 18 Aug. 1973

Thomas N. Blockwick, Robert L. Beach, Frank A. March, and Louis S. Brown Jul. 1974 124 p refs
(Contract DOT-CG-32781-A)
(AD-A006938; USCG-D-57-75) Avail: NTIS HC $5.25 CSCL 13/2

This report summarizes the at-sea tests of the 2000 gpm Ocean Systems, Inc., Weir-Basin Oil Recovery System (ORS) conducted at Port Hueneme, California, and at Point Conception, California. These tests were conducted without oil, with the purpose being to qualify the ORS with respect to strength, stability, operational function, ease of handling, compatibility with the Coast Guard lightweight oil containment barrier, and compatibility with Coast Guard buoy tenders. The tests showed that the 2000 gpm ORS was compatible with the barrier in both of the deployment configurations tested. Conformance to waves was very good, indicating that a high probability of obtaining high oil recovery efficiencies (percent oil in the recovered stream) could be expected. Launch and recovery from a buoy tender were successful, although a shorter length for the ORS was indicated to be desirable. Design modifications to minimize fabric wear and to increase the structural adequacy in certain areas are recommended. GRA

N75-22954# Air Force Weapons Lab., Kirtland AFB, N.Mex.

A GENERALIZED AIR QUALITY ASSESSMENT MODEL FOR AIR FORCE OPERATIONS Final Report, 1 May 1973 - 1 Nov. 1974

Donald M. Rote and Lawrence E. Wangen Feb. 1975 170 p refs Prepared by ANL
(AD-A006807; AFWL-TR-74-304) Avail: NTIS CSCL 13/2

The Air Quality Assessment Model (AQAM) is designed to serve as a generalized model that can be used to assess the impact of Air Force operations on the air environment at the air base level. This document constitutes the technical report to this effort and, as such, contains a discussion of the methodologies incorporated into the computer programs for the computation of pollutant emissions and the subsequent dispersal of these pollutants in the ambient air. Simulation of aircraft operations, temporal and spatial modeling of pollutant emissions, dispersion models based on the Gaussian plume formulation and other subjects germane to the model are discussed. The program contains a short-term dispersion model for hourly calculations and a climatological type model based on the air quality display model for long-time average concentration calculations. GRA

N75-22955# Coast Guard Research and Development Center, Groton, Conn.

TAR BALL DISTRIBUTION IN THE WESTERN NORTH ATLANTIC Final Report

W. E. McGowan, W. A. Saner, and G. L. Hufford Jul. 1974 29 p refs
(AD-A006821; CGR/DC-24/74; USCG-D-52-75) Avail: NTIS CSCL 13/2

Surface waters of the Atlantic Ocean were quantitatively sampled for floating tar balls from December 1971 to September 1973. It was found that tar ball concentrations (mg/sq m) generally increase from the Labrador Sea at ocean station Bravo (nearly tar ball free) south to the Sargasso Sea at ocean station Echo (greater than 2.6 mg/sq m). This south to north decrease in tar pollution was not only noted for the four ocean station sampling areas, but was also observed along the eastern coast of the United States. Analysis of thirty-five tar ball samples for iron (determined as Fe2O3) indicated high levels of Fe2O3. This implies previous association of the tar balls with iron or steel and suggests that man-made sources are partially responsible for tar ball pollution in addition to natural oil seeps. GRA

N75-22956# Battelle Columbus Labs., Ohio.

PROCEEDINGS OF THE SOLVENT REACTIVITY CONFERENCE

Basil Dimitriades Nov. 1974 46 p Sponsored by EPA
(PB-238296/8; EPA-650/3-74-010) Avail: NTIS HC $3.75 CSCL 13B

The concept of photochemical reactivity and its present use in solvent emissions control strategies was reexamined for validity, utility, and desirability. It was generally agreed that solvents and other stationary source emissions must be controlled and that use of reactivity criteria on such control is sound. The EPA suggested that the recently verified pollutant transport phenomena would tend to make Appendix B-type regulations more effective relative to the widely used Rule 66 regulation. Another consequence of pollutant transport is that the relatively unreactive organics are induced to form as much oxidant as the reactive ones. A reactivity classification of organics is based on considerations related to pollution problems caused both within a region and in the downwind areas. GRA

N75-22957# IIT Research Inst., Chicago, Ill.

EMISSIONS INVENTORY FROM FOREST WILDFIRES, FOREST MANAGED BURNS, AND AGRICULTURAL BURNS Final Report, Jan. - Aug. 1974

George Yamate Nov. 1974 34 p refs
(Contract EPA-68-02-1389)
(PB-238766/0; EPA-450/3-74-062) Avail: NTIS HC $3.75 CSCL 13B

The project was conducted to complete the area source inventories on emissions from forest wildfires, forest managed burns, and agricultural burns for each of the 55 states and territories. Reliable data and information on acreages burned and tons of fuel burned per acre were obtained for each of the approximately 3,100 counties and jurisdictional entities in the country. Literature searches, letters, telephone calls, and personal contacts were used in obtaining the results. The values obtained are the best and most reliable for these burning activities. No estimates were recorded for locations that had no available data of information. GRA

N75-22841 Joint Publications Research Service, Arlington, Va.

STUDY OF THE NATURE OF CHEMICAL POLLUTION DISTRIBUTION IN THE GULF STREAM REGION AND ITS EFFECT ON THE PRIMARY PRODUCTIVITY OF THE OCEAN WATER

S. G. Oradovskiy, A. I. Simonov, and A. A. Yushchak *In its* Meteorol. and Hydrology, No. 2, 1975 (JPRS-64670) 1 May 1975 p 58-69 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 2, 1975 p 48-58 (For availability see N75-22834 14-42)

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation.*

N75-22958 Columbia Univ., New York.
AMPLITUDES OF HORIZONTALLY REFRACTED LOVE WAVES Ph.D. Thesis
Soren Gregersen 1974 140 p
Avail: Univ. Microfilms Order No. 75-5220

Love wave transmission is studied numerically for propagation from one layered structure into another layered structure. By a new method of approximation, the transmission coefficients can be computed for propagation directions differing from normal incidence. The method treats the steady state case. The inhomogeneous plane waves are refleted and transmitted at a boundary just as are propagating (homogeneous) plane waves. The method is based on satisfying all boundary conditions on the vertical interface between the interface between two layered structures and computing the coupling between the interface stress-displacement field and the transmitted Love modes. The calculations are done rapidly on a computer. The results of the present approximation method compare favorable with finite element computations reported in the literature, which require far more computer time. Dissert. Abstr.

N75-22959 Stanford Univ., Calif.
MAGNETOSPHERIC CHORUS Ph.D. Thesis
William Judson Burtis 1974 179 p
Avail: Univ. Microfilms Order No. 75-6816

Characteristics of VLF chorus in the outer magnetosphere are investigated in a survey based on 400 hr of broadband data collected by OGO 3 during 1966-67. Bandlimited whistler-mode emissions constitute the dominant form of radiation, and the detailed description provides a starting point for a realistic theory of wave-particle interactions beyond the plasmapause. Spectrograms illustrate typical and unusual examples of magnetospheric chorus. The observations are interpreted in terms of whistler-mode propagation theory and a gyroresonant feedback interaction model. An exact expression is derived for the critical frequency at which the curvature of the refractive index surface vanishes at zero wave normal angle. Near this frequency rays with initial wave normal angles between 0 deg and -20 deg are focused along the initial field line for thousands of km, enhancing the phase-bunching of incoming gyroresonant electrons. The upper peak in the bimodal normalized frequency distribution is attributed to this enhancement near the critical frequency. The observations seem to be consistent with gyroresonant generation of emissions at low latitudes, followed by spreading of the radiation over a range of L shells farther down the field lines. Dissert. Abstr.

N75-22960 Princeton Univ., N.J.
THE NORMAL MODES OF A ROTATING, ELLIPTICAL EARTH Ph.D. Thesis
Martin L. Smith 1974 155 p
Avail: Univ. Microfilms Order No. 75-6678

The infinite set of coupled ordinary differential equations over radius that govern the infinitesimal free elastic-gravitational oscillations of a rotating, slightly elliptical earth with an isotropic perfectly elastic constitutive relation and a hydrostatic prestress field is derived. It is shown how the symmetries of such a body restrict the most general form of displacement eigenfunctions. Elastic-gravitational normal modes of a rotating, slightly elliptical earth that consist principally of translational motion of the solid inner core are numerically studied. The eigenfrequencies of these modes are shown to be sensitive to rotation, compressibility, outer-core stratification, and the density jump at the inner-core-outer-core boundary. Normal mode excitation theory is used to estimate the amplitude of inner-core translational motion excited by large earthquakes. Damping by both shear viscosity and compressional anelasticity is discussed. It is shown how to estimate these effects and numerical results are given. Dissert. Abstr.

N75-22961 Princeton Univ., N.J.
STRATIGRAPHY, SEDIMENTOLOGY AND OIL AND GAS GEOLOGY OF THE LOWER CRETACEOUS IN CENTRAL ALBERTA Ph.D. Thesis
Peter C. Badgley 1952 293 p
Avail: Univ. Microfilms Order No. 75-6717

A regional stratigraphic and sedimentological analysis of the Lower Cretaceous series in central Alberta, embracing a region in which a number of important oil and gas discoveries were made, is presented. Structure contour, isopach and isolith maps, and stratigraphic and structural cross-sections were constructed based on subsurface core, sample, and electric logs data. The Lower Cretaceous series was subdivided over a large area, and a comprehensive nomenclature scheme is recommended. The significance and lateral persistence of each subdivision is established, and correlations recommended. Significant facies changes were determined for the various formations. Petrographic methods were applied to the analysis of the Lower Cretaceous formations and a comparison of methods as well as a statement of results was possible. Several structural trends significant to the location of oil and gas fields were determined. Rapid up regional dip porous sandstone pinch outs, found in the Joseph Lake region, are considered to be the most favorable areas for light crude production. Dissert. Abstr.

N75-22962 Nevada Univ., Reno.
EARTH STRAIN OBSERVATIONS IN THE WESTERN GREAT BASIN Ph.D. Thesis
Keith Ferrin Priestley 1974 192 p
Avail: Univ. Microfilms Order No. 75-5300

Strains of tidal origin and long-period tectonic origin observed at two sites in central Nevada are discussed and compared with strain observations in other areas of the western United States. The principal tidal components discussed are the M sub 2 semi-diurnal tide, and the O sub 1 diurnal tide. The small discrepancies between the observed and predicted M sub 2 tide are found to be related to geologic and topographic structure near the strainmeter site. The O sub 1 diurnal tide is found to be distorted in the east-west direction due to the effect of the large O sub 1 oceanload tide along the Pacific coast acting on the heterogenous crust of the Great Basin. The tidal amplitude and heat flow for several sites in the western United States are compared. Long-period crustal strains, the result of tectonic processes in the earth, are observed at Round Mountain. These observations are found to agree with focal mechanism solutions of nearby microearthquakes and suggest strain accumulation. Periods of NW-SE extension followed by periods of NW-SE contraction are observed and suggest that the strain is partially relieved by microearthquakes, partially relieved by other inelastic processes such as creep, and accumulating at a low strain rate. Dissert. Abstr.

N75-22963 Colorado Univ., Boulder.
ELECTROMAGNETIC RADIATION AND PROPAGATION IN THE PRESENCE OF DISPERSIVE GEOLOGICAL MEDIA Ph.D. Thesis
James Alec Fuller 1974 303 p
Avail: Univ. Microfilms Order No. 75-3778

Solutions for electromagnetic boundary problems are exhibited including pulse propagation between buried antennas, mutual impedance between antennas that are within or over the earth, and excitation of buried antennas. Conventional system configurations are examined, but emphasis is placed on high frequency applications which introduce dispersive effects that are generally neglected in mining geophysics. The significant effects of dispersive parameters on through-the-earth and ground wave components of a pulse are demonstrated. Time-harmonic analyses and data are presented to extend two conventional probing techniques for HF operation. In one, mutual impedance between a small current loop and a coplanar loop or electric dipole is examined by placing the antennas on the surface of an exponentially stratified half-space. In the other, the mutual impedance between coaxial loops is examined by displacing the loops along the axis of a drill hole. A transmission line theory and numerical results are presented to describe the current on a finite, insulated cable that radiates from an uncased section of a drill hole. Dissert. Abstr.

N75-22964 New Mexico Univ., Albuquerque.
NEUTRON AND PROTON MEASUREMENTS OF OSO-6 NEAR THE SOUTH ATLANTIC RADIATION ANOMALY Ph.D. Thesis
Philip Jay Cooper 1974 115 p
Avail: Univ. Microfilms Order No. 75-6963

The high energy neutron experiment was designed and built to study neutrons at an altitude of approximately 500 km, above the earth's dense atmosphere. The detector was a proton recoil telescope with directional discrimination, and was sensitive to protons as well as neutrons. The source and loss mechanisms of the Van Allen radiation belts were investigated, and the omnidirectional proton flux as a function of B and L at approximately 500 km altitude in the anomaly (latitude limit -33 degrees) is presented. Atmospheric energy loss scale heights were determined from the east-west asymmetry of mirroring protons and compared with previous experiments and model atmosphere calculations. The results cover minimum mirroring altitudes from 50 to 550 km and L from 1.1 to 1.8. Pitch angle distributions of trapped protons were observed and fitted width Gaussian functions. The half-widths of the Gaussians were compared with predicted values for protons in a dipole magnetic field and an exponential atmosphere. The neutron data was studied to determine if there is enhanced neutron production in the South Atlantic anomaly. Dissert. Abstr.

N75-22965 Stanford Univ., Calif.
FAST HISSLERS: A FORM OF MAGNETOSPHERIC RADIO EMISSIONS Ph.D. Thesis
Jan Curtis Siren 1974 137 p
Avail: Univ. Microfilms Order No. 75-6926

Auroral radio hiss bursts in the frequency range 2-18 kHz were observed, with rise or turn-on times of 20-50 ms, and fall or turn-off times of 20-80 ms. These time scales are too brief to reconcile with the Cerenkov radiation emission mechanism often proposed as the transducer that converts precipitating auroral electron kinetic energy into very-low-frequency radio wave energy. The auroral hiss bursts, called 'fast hisslers', are observed to be 'dispersed;' their arrival time at the receiving site is not simultaneous at all frequencies, but depends on frequency in a way that is consistent with propagation in the whistler mode of electromagnetic wave propagation. Since whistler mode wave propagation at these frequencies occurs only in the earth's magnetosphere, it is inferred that these fast hisslers are of magnetospheric origin. Fine details of some of the amplitude spectra of fast hisslers were examined. Dissert. Abstr.

N75-22966 Wisconsin Univ., Milwaukee.
STRONG AND WEAK GRAVITY: A GENERALLY COVARIANT CLASS OF MIXING MODELS OF SPIN-2 NEUTRAL FIELDS Ph.D. Thesis
William Carl Hammel, Jr. 1974 254 p
Avail: Univ. Microfilms Order No. 75-9112

The desirability of modifying Einstein's gravitational theory within small distances is discussed. A generally covariant class of Lagrangians is proposed to do this. The physical cause of the short range modification is expected to be the existence of a heavy spin-2 meson. General theorems concerning the existence of solutions of specified form are proved, and certain solutions are given explicity. In particular all constant solutions are given some of which determine two cones. The mass and spin content of the linearized equations is partially analyzed, and a local exact spherically symmetric solution is given which modifies the Schwarzschild field only within the Schwarzschild surface r = 2 sq m. We prove that the two tensor fields need not possess the same isometry groups and begin an investigation of the consequences of a generalized Kerr-Schild Ansatz.
Dissert. Abstr.

N75-22967 Department of Energy, Mines and Resources, Ottawa (Ontario). Earth Resources Branch.
RECORD OF OBSERVATIONS AT OTTAWA MAGNETIC OBSERVATORY, JULY 1968 TO DECEMBER 1969, VOLUME 46, NO. 1
J. Hruska 1974 86 p refs
Copyright. Avail: Issuing Activity

Geomagnetic data for July, 1968 to December, 1969 are presented in tables. The following instruments in use at the Ottawa Magnetic Observatory are described: photographic variometers, stand-by variometer and storm recorder, electronic integrator, digital magnetometer, rapid-run recorder, and absolute instruments. J.M.S.

N75-22968 State Univ. of New York, Albany.
A DIAGNOSTIC STUDY OF INTERACTIONS OF MID-LATITUDE AND TROPICAL CIRCULATIONS Ph.D. Thesis
Tai-Jen George Chen 1974 221 p
Avail: Univ. Microfilms Order No. 75-9622

Cases of intense polar outbreaks were selected to study the winter interactions of mid-latitude and tropical weather systems. Vorticity budget and kinetic energy budget equations are developed on a quasi-Lagrangian coordinate system to study the dynamics of the polar anticyclones and the downstream cyclones. Results show that the divergence and twisting terms in the lower troposphere and the horizontal advection and twisting terms in the mid-troposphere were crucial in determining both the southeastward movement and maintaining the intensity of the surface anticyclone. The convergence term in the lower troposphere and horizontal advection term in the mid-troposphere primarily determined downstream cyclogenesis. The possible role of the synoptic-subsynoptic scale energy exchange in the synoptic scale kinetic energy generation for the surface anticyclone is suggested. Dissert. Abstr.

N75-22969 California Inst. of Tech., Pasadena.
INVESTIGATION OF ATMOSPHERIC DISPERSION PROBLEMS BY MEANS OF A TRACER TECHNIQUE Ph.D. Thesis
Peter John Drivas 1975 204 p
Avail: Univ. Microfilms Order No. 75-9522

The possible extension of an existing atmospheric tracer technique was studied to determine the sensitivity and usefulness of this technique. Several complex atmospheric dispersion problems were investigated including the following: ventilation systems in buildings; air flow within the wake downwind of a building; dispersion from an urban highway; and large-scale transport and dispersion over the Los Angeles area. The air sampling and analysis techniques were developed to permit a minimum detection limit. Quantitative data were obtained regarding actual residence time distributions in rooms and hallways, and contamination caused by reentry of laboratory fume hood exhausts into a building. Data were also used to test the validity of several theoretical models. Dissert. Abstr.

N75-22970 Institut d'Aeronomie Spatiale de Belgique, Brussels.
TRANSITION FROM THE HOMOSPHERE TO THE HETEROSPHERE IN THE TERRESTRIAL ATMOSPHERE Ph.D. Thesis (Brussels Univ.) [LA TRANSITION DE L'HOMOSPHERE A L'HETEROSPHERE DE L'ATMOSPHERE TERRESTRE]
L. DaMata 1974 236 p refs In FRENCH; ENGLISH summary
(Aeronomica-Acta-A-140-1974) Avail: Issuing Activity

To improve the knowledge of the composition of the transition region from the homosphere to the heterosphere in the terrestrial homosphere, a horizontally homogeneous atmosphere with known thermal structure was considered and the corresponding equations of continuity and transport of atoms and molecules solved. An atmosphere formed by chemically active gases, submitted to the molecular photodissociation under the solar ultraviolet radiation effect, and subjected to transport mechanisms due to eddy and molecular diffusion was considered using theoretical models and observational data. The equations governing the upper atmosphere energetics, dynamics, and composition were solved keeping in mind the problem of the boundary conditions. The values of certain aeronomical parameters such as the eddy diffusion coefficients, the solar ultra violet flux, and the mixing ratio of water vapor on the lower part of the domain were analyzed. ESRO

N75-22971 Institut d'Aeronomie Spatiale de Belgique, Brussels.
NO, NO2 AND HNO3 BELOW 35 km IN THE ATMOSPHERE
M. Ackerman 1975 30 p refs Submitted for publication
(Aeronomica-Acta-A-142-1975) Avail: Issuing activity

Experimental data on nitric oxide, nitrogen monoxide, and ammonia in the atmosphere are reviewed. The low abundance

of nitric acid in the tropospheric gas phase is emphasized as well as the high variability of NO in the low stratosphere and in the troposphere. Some model predicted distributions of these odd nitrogen molecules are presented. Areas of agreement and of disagreement between theory and experiments are indicated.
Author (ESRO)

N75-22972 Institut d'Aeronomie Spatiale de Belgique, Brussels.
THE MECHANISMS OF FORMATION OF THE PLASMAPAUSE
J. Lemaire 1975 48 p refs Presented at the 2d Meeting of the European Geophys. Soc. on Phys. of the Plasmapause, Trieste, Italy, 23-26 Sep. 1974 Submitted for publication
(Aeronomica-Acta-A-143-1975) Avail: Issuing Activity

The magnetospheric electric field plays a determining role in the formation of the sharp drop in the thermal plasma density distribution. The two physically different theories proposed for the formation of this field aligned boundary are reviewed. The first of these mechanisms is based on the MHD approximation; it is considered that the position of the steady state plasmapause is determined by the last closed equipotential surface of the convection-corotation electric field distribution. In the second quasi-MHD approximation the finite value of the integrated Pedersen conductivity was taken into account to determine the plasmapause position associated with McIlwain's electric field models. As a consequence of the reduced traverse conductivities in the night side region, flux tube interchange motions can peel off the plasmasphere near midnight. The resulting outward transport of small-scale plasma elements is driven by gradient B and curvature drifts, as well as by the outward directed centrifugal force which becomes important beyond a Roche Limit surface. Several consequences of both of these alternative approaches are discussed. Author (ESRO)

N75-22973 Institut d'Aeronomie Spatiale de Belgique, Brussels.
DAYTIME VALLEY IN THE F1 REGION OBSERVED BY INCOHERENT SCATTER
C. Taieb (Centre Natl. d'Etudes de Telecommun., Issy-les-Mounineaux, France), G. Scialom (Centre Natl. d'Etudes de Telecommun., Issy-les-Mouline-aux, France), and G. Kockarts 1975 25 p refs Submitted for publication
(Aeronomica-Acta-A-144-1975) Avail: Issuing Activity

Incoherent scatter data obtained at Saint-Santin were analyzed between 1969 and 1972 in the height interval 120 to 200 km. The summer daytime electron density profiles show a maximum around 150 km followed by a minimum around 165 km, when the solar activity is low. The seasonal and solar cycle variations of this phenomenon are discussed. When the daytime valley exists, the maximum density is approximately 20 to 30% greater than the minimum value. The phenomenon cannot be fully explained on the basis of photochemical equilibrium.
Author (ESRO)

N75-22974*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
GRAVITATIONAL CLOCK: A PROPOSED EXPERIMENT FOR THE MEASUREMENT OF THE GRAVITATIONAL CONSTANT G
Larry L. Smalley 23 Jan. 1975 36 p refs
(NASA-TM-X-64920) Avail: NTIS HC $3.75 CSCL 20J

The increased importance and the fundamental significance of accurately measuring the gravitational constant G are discussed along with recent or proposed experimental measurements of G. The method of using mutually gravitating bodies in the clock mode in a drag-free satellite is described. A satellite experiment consisting of the flat-plate spherical mass oscillator proposed combines the mathematical and experimental conveniences most simply. It is estimated that accuracies of 1 part in 1,000,000 are easily obtainable by careful fabrication of parts. The use of cryogenic techniques, thin films, and superconductors allows increased accuracies of two or three orders of magnitude or better. These measurements can be increased to the level of 1 part in 10 to the 11th power at which time-variations, and other variations, in G can be observed. Author

N75-22975*# New York Univ., N.Y. Courant Inst. of Mathematical Sciences.
STEADY-STATE SOLUTIONS OF A DIFFUSIVE ENERGY-BALANCE CLIMATE MODEL AND THEIR STABILITY
Michael Ghil May 1975 79 p refs
(Grants NsG-5034; AF-AFOSR-2728-74; ARPA Order 2774)
(NASA-CR-142705; IMM-410) Avail: NTIS HC $4.75 CSCL 04A

A diffusive energy-balance climate model, governed by a nonlinear parabolic partial differential equation, was studied. Three positive steady-state solutions of this equation are found; they correspond to three possible climates of our planet: an interglacial (nearly identical to the present climate), a glacial, and a completely icecovered earth. Models similar to the main one are considered, and the number of their steady states was determined. All the models have albedo continuously varying with latitude and temperature, and entirely diffusive horizontal heat transfer. The stability under small perturbations of the main model's climates was investigated. A stability criterion is derived, and its application shows that the present climate and the deep freeze are stable, whereas the model's glacial is unstable. The dependence was examined of the number of steady states and of their stability on the average solar radiation. Author

N75-22976*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
PARAMETRIC STUDIES WITH AN ATMOSPHERIC DIFFUSION MODEL THAT ASSESSES TOXIC FUEL HAZARDS DUE TO THE GROUND CLOUDS GENERATED BY ROCKET LAUNCHES
Roger B. Stewart and William L. Grose Washington May 1975 65 p refs
(NASA-TN-D-7852; L-9694) Avail: NTIS HC $4.25 CSCL 04A

Parametric studies were made with a multilayer atmospheric diffusion model to place quantitative limits on the uncertainty of predicting ground-level toxic rocket-fuel concentrations. Exhaust distributions in the ground cloud, cloud stabilized geometry, atmospheric coefficients, the effects of exhaust plume afterburning of carbon monoxide CO, assumed surface mixing-layer division in the model, and model sensitivity to different meteorological regimes were studied. Large-scale differences in ground-level predictions are quantitatively described. Cloud alongwind growth for several meteorological conditions is shown to be in error because of incorrect application of previous diffusion theory. In addition, rocket-plume calculations indicate that almost all of the rocket-motor carbon monoxide is afterburned to carbon dioxide CO2, thus reducing toxic hazards due to CO. The afterburning is also shown to have a significant effect on cloud stabilization height and on ground-level concentrations of exhaust products.
Author

N75-22977*# PBR Electronics, Inc., Athens, Ala.
RAMAN BACKSCATTER MEASUREMENT RESEARCH ON WATER VAPOR SYSTEMS Final Report
Gary L. Workman 10 Apr. 1975 37 p refs
(Contract NAS8-30805)
(NASA-CR-120741) Avail: NTIS HC $3.75 CSCL 04A

Raman backscatter techniques proved to be a useful remote sensing tool, whose full potential has not been realized. The types of information available from laser probes in atmospheric studies are reviewed. Detection levels for known Raman cross sections are calculated using the laser radar equation. Laboratory experiments performed for H2O, N2, SO2, O2 and HCL indicate that accurate wavelength cross sections need to be obtained, as well as more emphasis on obtaining accurate Raman cross sections of molecular species at wavelengths in the ultraviolet spectra. Author

N75-22978*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
COULOMB COLLISIONS OF RING CURRENT PARTICLES: INDIRECT SOURCE OF HEAT FOR THE IONOSPHERE
Keith D. Cole Apr. 1975 22 p refs Submitted for publication
(NASA-TM-X-70885; X-621-75-108) Avail: NTIS HC $3.25 CSCL 04A

The additional energy requirements of the topside ionosphere during a magnetic storm are less than one quarter of the ring current energy. This energy is supplied largely by Coulomb collisions of ring current protons of energy less than about 20 keV

with background thermal electrons which conduct the heat to the ionosphere. Past criticisms are discussed of this mechanism for the supply of energy to the SAR-arc and neighboring regions of the ionosphere. Author

N75-22979*# Denver Univ., Colo. Dept. of Physics and Astronomy.
MEASUREMENTS OF ATMOSPHERIC EMISSION SPECTRA IN THE 8.5MU m TO 13.3MU m AND 19.0MU m TO 26.0MU m REGIONS AT HIGH ALTITUDES AND VARIOUS ZENITH ANGLES Final Report
D. G. Murcray, J. N. Brooks, J. J. Kosters, and W. J. Williams Apr. 1975 65 p
(Grant NGR-06-004-131)
(NASA-CR-142726) Avail: NTIS HC $4.25 CSCL 04A

A balloon flight was conducted with a sensitive infrared spectral radiometer system in support of the LACATE balloon experiment. The instrumentation aboard the balloon is described along with data reduction techniques. Results obtained during the flight are presented. J.M.S.

N75-22980*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE EARTH'S TRAPPED RADIATION BELTS NASA Space Vehicle Design Criteria (Environment)
Richard B. Noll and Michael B. McElroy Mar. 1975 100 p refs
(NASA-SP-8116) Avail: NTIS HC $4.75 CSCL 03B

The near-earth charged particle environment is discussed in terms of spacecraft design criteria. Models are presented of the trapped radiation belts and based on in-situ data obtained from spacecraft. Author

N75-22981*# Alabama Univ., Huntsville. Div. of Graduate Programs and Research.
INVESTIGATIONS OF ATMOSPHERIC DYNAMICS USING A CW DOPPLER SOUNDER ARRAY Final Technical Report
Ganti L. Rao Feb. 1974 73 p refs
(Contract NAS8-29317)
(NASA-CR-120189) Avail: NTIS HC $4.25 CSCL 04A

A three-dimensional CW Doppler sounding system currently under operation at the NASA-Marshall Space Flight Center, Alabama is described. The properties of the neutral atmosphere are discussed along with the theory of Doppler sounding technique. Methods of data analyses used to investigate the dynamical phenomena at the ionospheric heights are presented and suggestions for future investigations provided. Author

N75-22982# California Univ., Livermore. Lawrence Livermore Lab.
GENKIN-1: A GENERAL KINETICS CODE: ATMOSPHERIC APPLICATIONS
R. J. Gelinas and R. P. Dickinson 6 Aug. 1974 109 p refs
(Contract W-7405-eng-48)
(UCID-16577) Avail: NTIS HC $5.25

A first version of a multipurpose, semi-automatic code for setting up and reliably solving large coupled sets of stiff, nonlinear kinetic equations is described. The present code, GENKIN-I, features and utilizes advanced variants of the basic GEAR method to stably and accurately solve large sets of stiff nonlinear differential equations. The present reaction library that interfaces with the general kinetics code emphasizes atmospheric chemical and radiative interaction processes. Reaction libraries for other applications, such as gas lasers, ionic systems, combustion kinetics, coal, and other fuel conversion processes, and biological kinetics can be interfaced to the general kinetics code. NSA

N75-22983# Brookhaven National Lab., Upton, N.Y.
SULFUR ISOTOPE RATIO TECHNIQUE
A. W. Castleman, Jr. and H. R. Munkelwitz Oct. 1974 16 p refs Sponsored by ERDA
(BNL-19496) Avail: NTIS HC $3.25

The general distribution of the stratospheric aerosol layer comprised of sulfates of terrestrial origin is discussed. The techniques of isotopic ratio tracing are employed in order to elucidate the mechanisms responsible for the formation of the layer as well as establish the significance of volcanic sources compared to the other sources of sulfur compounds of terrestrial origin. The results suggest that aerosols carried upward in large storm clouds make only a minor contribution to the persistent globally distributed layer. NSA

N75-22984# Institut Royal Meteorologique de Belgique, Brussels.
OZONE OBSERVATIONS [OBSERVATIONS D'OZONE QUATRIEME TRIMESTRE 1970]
1974 52 p ref In FRENCH and DUTCH
(QR-4) Avail: NTIS HC $4.25

Spectrophotometric ozone measurements are reported for the fourth quarter of 1970. The presented ozonograms contain designations for partial ozone pressure and atmospheric diffusion, air temperature, and used wavelengths. ESRO

N75-22985# Institut Royal Meteorologique de Belgique, Brussels.
IONOSPHERIC AND COSMIC RAY OBSERVATIONS Monthly Bulletin, Jul. 1974 [OBSERVATIONS IONOSPHERIQUES ET DU RAYONNEMENT COSMIQUE BULLETIN MENSUEL, JUILLET 1974]
Jul. 1974 31 p In FRENCH and DUTCH
Avail: NTIS HC $3.75

Results of ionospheric and cosmic ray (neutron component) observations at Dourbes (Belgium) are tabulated for July 1974. ESRO

N75-22986# Institut Royal Meteorologique de Belgique, Brussels.
GEOPHYSICAL OBSERVATIONS Monthly Bulletin, Jun. 1974 [OBSERVATIONS GEOPHYSIQUES BULLETIN MENSUEL, JUIN 1974]
Jun. 1974 26 p In FRENCH and DUTCH
Avail: NTIS HC $3.75

Geophysical data obtained at Dourbes (Belgium) relating to geomagnetism, air radioactivity, ionospheric parameters, seismology, atmospheric electricity, and cosmic rays during June 1974 are presented. ESRO

N75-22987# Institut Royal Meteorologique de Belgique, Brussels.
GEOPHYSICAL OBSERVATIONS Monthly Bulletin, Jul. 1974 [OBSERVATIONS GEOPHYSIQUES BULLETIN MENSUEL, JUILLET 1974]
Jul. 1974 26 p In FRENCH and DUTCH
Avail: NTIS HC $3.75

Geophysical data obtained at Dourbes (Belgium) relating to geomagnetism, air radioactivity, ionospheric parameters, seismology, atmospheric electricity, and cosmic rays during July 1974 are presented. ESRO

N75-22988# European Space Research Organization, Paris (France).
OPTICAL EXPERIMENTS IN THE DIVISION FOR EXTRATERRESTRIAL SENSOR TECHNIQUES AS A CONTRIBUTION IN THE FIELD OF EXTRATERRESTRIAL RESEARCH
Dieter Beran et al Feb. 1975 49 p refs Transl. into ENGLISH of 'Opt. Experimente in der Abt. Extraterrestrische Sensortech. als Beitr. Zur extraterrestrischen Forsch.', DFVLR, Porz, West Ger. Report DLR-Mitt-74-17, 13 Mar. 1974 Original German report available from DFVLR, Porz, West Ger. 20.20 DM
(ESRO-TT-133; DLR-Mitt-74-17) Avail: NTIS HC $3.75

Research projects in the evaluation phase are summarized together with experiments being developed for sounding rocket programs. Former projects, already flown, include polar light investigations, and measurement of airglow emissions of atomic oxygen. The latter experiments will investigate phenomena in aeronomy and astronomy. The Division's laboratory equipment is described. ESRO

N75-22989# Washington Univ., Seattle. Arctic Ice Dynamics Joint Experiment Office.
AIDJEX BULLETIN NUMBER 26
Nov. 1974 181 p refs
(Contract NSF C-625)
(PB-238573/8; AIDJEX-74-27) Avail: NTIS HC $7.00 CSCL 08L

The use of satellite photographs to determine the movement and deformation of sea ice, further work on elastic strain and plastic deformation in the AIDJEX model, the goals for remote sensing during the AIDIEX main experiment, hydrostatic leveling

on sea ice, and the reconnaissance of Peister's Ice Island carried out this summer by AIDJEX and the Canadian Polar Continental Shelf Project are reported. The last part of the Bulletin is devoted to reports from the AIDJEX lead experiment of spring 1974, a program designed to gather information about the interaction between the ocean and the atmosphere through open and freezing leads. GRA

N75-22990# California Inst. of Tech., Pasadena. Earthquake Engineering Research Lab.
ANALYSIS OF STRONG MOTION EARTHQUAKE ACCELEROGRAMS. VOLUME 3: RESPONSE SPECTRA. PARTS O AND P: ACCELEROGRAMS IIP214 TO IIP223, IIP231 AND IIP232
M. D. Trifunac, A. G. Brady, and D. E. Hudson Jun. 1974 296 p refs
(Grant NSF GK-28098)
(PB-238102/8; EERL-74-84-Vol-3-Pt-O/P) Avail: NTIS HC $8.75 CSCL 08K

Earthquake response spectrum curves calculated from corrected accelerograms are reported. A summary of response spectrum techniques in earthquake engineering is reported which is available as background material for the data. For each earthquake accelerogram, two spectrum plots are given - relative velocity response versus period on a linear scale, and a tripartite log-log plot giving relative displacement, pseudo-velocity, and pseudo-acceleration spectra. The Fourier spectrum is also shown on the linear plot. Digital printout of ordinates of the plotted curves are tabulated for each earthquake. GRA

N75-22991# California Inst. of Tech., Pasadena. Earthquake Engineering Lab.
ANALYSIS OF STRONG MOTION EARTHQUAKE ACCELOGRAMS. VOLUME 4: FOURIER AMPLITUDE SPECTRA. PARTS N, O, AND P: ACCELOGRAMS IIN185 TO IIN197, IIO198 TO IIO201, IIO204 TO IIO208, IIO210, IIP214 TO IIP223, IIP231 AND IIP232, IIO213
M. D. Trifunac, A. G. Brady, and D. E. Hudson Jun. 1974 236 p refs
(Grant NSF GI-28098)
(PB-238447/7; EERL-74-103-Vol-4-Pt-N/O/P) Avail: NTIS HC $7.50 CSCL 08K

Fourier amplitude spectra are presented for earthquake ground motions and for structural response accelerations. For each earthquake accelerogram, two spectrum plots are given - a Fourier amplitude spectrum versus frequency on a linear scale and a log-spectrum, log-frequency plot. Fourier amplitude spectra are given for all corrected accelerograms, including building response measurements. GRA

N75-22992# National Oceanic and Atmospheric Administration, Boulder, Colo. Space Environment Lab.
SOURCES AND SINKS OF ENERGY IN THE LOWER THERMOSPHERE Ph.D. Thesis
Gene W. Adams Oct. 1974 242 p refs Prepared for Colorado Univ., Boulder Sponsored in part by ARPA
(COM-75-50051/2; NOAA-TR-ERL-304) Avail: NTIS HC $7.50 CSCL 04A

The sources and sinks of energy in the subauroral lower thermosphere (80-150 km) were investigated. Heating and cooling rates due to molecular thermal conduction were calculated using the U.S. Standard Atmosphere, including variations with altitude, latitude, season, and solar activity. Molecular thermal conduction cools the atmosphere above (typically) 125 km and heats below, although the crossover altitude varies strongly with solar activity. Solar photon absorption in the 40 to 3000A region was calculated, with allocation of the initially absorbed energy into ionization, dissociation, excitation, and direct heating. These calculations were done as a function of altitude, latitude, season, and wavelength. GRA

N75-22993# Stanford Research Inst., Menlo Park, Calif.
STRATOSPHERIC ELECTRICITY AND THE GLOBAL CIRCUIT
E. T. Pierce Dec. 1974 17 p refs
(Contract N00014-74-C-0134; SRI Proj. 3062)
(AD-A006979) Avail: NTIS CSCL 04/1

The relationship of stratospheric electrification to concepts of the global circuit is discussed. The precise profile of electrical conductivity is shown to be critical to the global circuit. A maximum in conductivity due to a very small concentration of free electrons may exist at 50 km. This would tend to channel currents laterally rather in the manner conceived in the crude model of the global circuit. GRA

N75-22994# Texas Instruments, Inc., Dallas. Equipment Group.
EARTH NOISE AT VERY LONG PERIOD EXPERIMENT STATIONS. TECHNICAL REPORT NO. 3: VELA NETWORK EVALUATION AND AUTOMATIC PROCESSING RESEARCH
Sidney R. Prahl 27 Nov. 1974 77 p refs
(Contract F08606-74-C-0033)
(AD-A007044; TI-ALEX(01)-TR-74-03) Avail: NTIS CSCL 17/10

The report presents the results of a study of the noise characteristics of eleven Very Long Period Experiment (VLPE) stations. For the period from January 1972 through March 1973, 1503 one-hour vertical component and 846 one-hour three component noise samples were processed and analyzed for short- and long-term vertical component noise trends, three component spectra, and two-component coherence spectra. GRA

N75-22995# Maryland Univ., College Park. Inst. for Molecular Physics.
THEORETICAL STUDY OF INFRARED SPECTRA OF ATMOSPHERIC GAS MOLECULES
W. S. Benedict 20 Dec. 1974 9 p
(Contract F19628-72-C-0248; AF Proj. 8603)
(AD-A006726; AFCRL-TR-74-0628; SR-1) Avail: NTIS CSCL 07/4

A brief summary is given of advances in the determination of vibration-rotation energy levels of H2O and HDO. Line width calculations in those molecules, and deviations from the Lorentz line shape are touched upon. GRA

N75-22996# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
TABLES OF VERTICAL CUTOFF RIGIDITIES FOR EPOCHS 1955 AND 1960 Environmental Research Papers
M .A. Shea, D. F. Smart, J. R. McCall, and B. S. Gumm 4 Nov. 1974 88 p refs
(AF Proj. 6813)
(AD-A006677; AFCRL-ERP-493; AFCRL-TR-74-0550) Avail: NTIS CSCL 04/1

Tables of vertical cutoff rigidities calculated using the trajectory-tracing technique are given for two epochs of the geomagnetic field. The Finch and Leaton magnetic field coefficients were used for Epoch 1955, and the Jensen and Cain coefficients were used for Epoch 1960. Each table includes the geographic coordinates and L value of each location together with the main cone cutoff rigidity, the Stormer cutoff rigidity, and the effective cutoff rigidity. Data for approximately 2900 locations on the earth are presented. GRA

N75-22997# Texas Instruments, Inc., Dallas. Dallas Equipment Group.
EVALUATION OF MATCHED FILTERS AND THE THREE-COMPONENT ADAPTIVE PROCESSOR FOR THE VLPE STATIONS AND VLPE NETWORK
Alan C. Strauss and Alexandra I. Tolstoy 10 Oct. 1974 99 p
(VT Proj. 4705/B/ETR)
(AD-A007050; TI-ALEX(01)-TR-74-05; TR-5) Avail: NTIS CSCL 17/10

The report describes the evaluation of the chirp matched filter, the reference waveform matched filter, and the three-component adaptive processor in terms of events from two seismic regions and one presumed explosion test region as recorded by stations of the Very Long Period Experiment. GRA

N75-22998# Honeywell, Inc., Hopkins, Minn. Government and Aeronautical Products Div.
TWO-CLASS LOGIC MODULE/ADSID INTEGRATION PROGRAM Final Report, 5 Apr. 1972 - 5 Sep. 1974
D. P. Erdmann, L. H. Tveten, and B. E. Barnes Jan. 1975 79 p refs

(Contract F30602-72-C-0289)
(AD-A006754; Rept-45770; RADC-TR-74-332) Avail: NTIS CSCL 17/10

The Two-Class Seismic Classifier was developed to improve the processing electronics portion of the ADSID 3. The electronics process the target signature received. If the signature shows the presence of a target, an output signal will be provided through the system transmitter. The low false-alarm rate of the Two-Class Seismic Classifier Module greatly reduces the need for large, sophisticated data-handling and processing centers for target discrimination. Because of the high reliability of the target information available from the ADSID 3 using the Two-Class module, the information can be treated in a real-time manner. The processing electronics and disable function are packaged in a hardened module and are, therefore, capable of withstanding high shock. Worldwide temperature capability is also designed into the module. GRA

N75-22999# Army Cold Regions Research and Engineering Lab., Hanover, N.H.
SPLINE APPROXIMATION TO THE FREEZING OF WATER IN A CYLINDRICAL HOLE DRILLED IN AN ICE SHEET
Shunsuke Takagi Feb. 1975 17 p
(AD-A006581; CRREL-RR-328) Avail: NTIS CSCL 08/12

An interpolation continuous up to the first-order derivatives is needed to solve this problem, because the first-order derivatives are used in the formulation of the movement of the freezing front. The requirement is met in this paper by use of a parabolic spline. The Crank-Nicholson formula is used to set up the predictor-corrector scheme of time integration. Several iterations are needed to advance one step in time because of the implicit nature of the Crank-Nicholson formula and the nonlinearity involved in the freezing problem. GRA

N75-23000# IIT Research Inst., Chicago, Ill.
CHEMICAL COMPOSITION OF THE ATMOSPHERE AT 40,000 - 65,000 FEET USING A MODIFIED MATRIX ISOLATION TECHNIQUE Final Report, 1 Aug. 1972 - 31 Jul. 1974
Alan Snelson 24 Sep. 1974 72 p refs
(Contract F44620-73-C-0006; AF Proj. 9750)
(AD-A000574; IITRI-C6269-8; AFOSR-74-1727TR) Avail: NTIS CSCL 04/1

The results of a program to obtain trace gas analyses of air samples collected in the 40,000 to 65,000 feet range using a new mechanical cryogenic whole air sampler flown on an RB57 aircraft are described. To accomplish the program goals, a standard laboratory mechanical cryostat was suitably modified to permit operation and sample acquisition at high altitudes. Typically between 0.5-4.0 liters of N.T.P. air were collected. A total of nine sampling flights were made. Chemical analyses for CH4, C2H4, CO2, CO, N2O and H2 were made using chromatographic techniques. (Modified author abstract) GRA

N75-22835 Joint Publications Research Service, Arlington, Va.
CENTER OF ATMOSPHERIC CIRCULATION
N. A. Bagrov *In its* Meteorol. and Hydrology, No. 2, 1975 (JPRS-64670) 1 May 1975 p 1-12 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 2, 1975 p 3-11 (For availability see N75-22834 14-42)

N75-22837 Joint Publications Research Service, Arlington, Va.
SOME PECULIARITIES OF THE INTRATROPICAL ZONE OF CONVERGENCE ACCORDING TO OBSERVATIONS FROM METEOROLOGICAL SATELLITES
Ye. K. Semenov *In its* Meteorol. and Hydrology, No. 2, 1975 (JPRS-64670) 1 May 1975 p 25-34 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 2, 1975 p 22-29 (For availability see N75-22834 14-42)

N75-22842 Joint Publications Research Service, Arlington, Va.
APPLICATION OF DISCRIMINANT ANALYSIS FOR LONG-RANGE FORECASTING OF THE APPEARANCE AND DISAPPEARANCE OF ICE IN THE ARAL SEA
V. V. Oganesyan *In its* Meteorol. and Hydrology, No. 2, 1975 (JPRS-64670) 1 May 1975 p 70-78 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 2, 1975 p 59-65 (For availability see N75-22834 14-42)

N75-22846 Joint Publications Research Service, Arlington, Va.
THE PECULIARITIES OF LONG-WAVE RADIATION FLUX DISTRIBUTION IN THE EQUATORIAL ATLANTIC IN THE SUMMER OF 1972 (ACCORDING TO THE ACTINOMETRIC RADIOSOUNDING DATA)
N. A. Zaytseva and T. M. Krasnova *In its* Meteorol. and Hydrology, No. 2, 1975 (JPRS-64670) 1 May 1975 p 107-119 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 2, 1975 p 88-98 (For availability see N75-22834 14-42)

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N75-23001 Wisconsin Univ., Madison.
OBSERVATIONS OF CONVECTIVE SCALE TURBULENCE OVER THE TROPICAL OCEAN Ph.D. Thesis
Elizabeth Ashton Berman 1974 101 p
Avail: Univ. Microfilms Order No. 75-2446

Measurements of wind velocity, temperature, and humidity were made from extended tethered balloon observations over the tropical ocean at 20 deg N, 60 deg W, during an undisturbed period. Spectra of temperature and the down-wind velocity component are presented in the frequency band from 0.000297 Hz to 0.125 Hz. A -5/3 power law is found in the turbulent mixed layer and a -3 power law is seen in the overlying stable cloud layer. Spectra of the vertical velocity and cross spectra of vertical fluxes of momentum, sensible heat, and water vapor are presented in the frequency band from 0.000297 Hz to 0.0178 Hz. Convective eddies are found in the wavelength region from 1 km to 3 km and appear to depend on atmospheric stability and water vapor flux for structure. Moisture is shown to regulate convective activity. Dissert. Abstr.

N75-23002 Washington State Univ., Pullman.
THE BEHAVIOR OF EVAPOTRANSPIRATION AND EVAPORATIONS UNDER VARYING CLIMATIC CONDITIONS Ph.D. Thesis
Alejandro Valenzuela 1974 221 p
Avail: Univ. Microfilms Order No. 75-7670

Equations developed in different parts of the world were used to calculate potential evapotranspiration (PET). The equations were compared by testing the behavior of each equation under real and theoretical conditions. The resulting evapotranspiration rates gathered from four meteorological stations were compared using a split-plot design. The statistical comparison shows that the PET estimates of the 10 equations are significantly different for summer conditions for the four locations, but that some equations yielded statistically similar results during winter. It is suggested, that most of the equations can be improved to agree more closely with actual PET values. An equation is proposed to compare water requirement sensitivity to climatic parameters with water requirement sensitivity to irrigation efficiency. Dissert. Abstr.

N75-23003 Syracuse Univ., N.Y.
A COST-EFFECTIVE ASSOCIATIVE PROCESSOR WITH APPLICATION TO WEATHER COMPUTATIONS Ph.D. Thesis
Wei-Tih Cheng 1974 379 p
Avail: Univ. Microfilms Order No. 75-10529

Problems encountered in parallel processing are discussed. A set of steps for designing a more cost-effective parallel processor is suggested. An associative processor organization with application to weather computations is used as a particular example for system analysis, evaluation, and design. The area of global simulation is chosen from various categories of weather computations to be studied, and specifically, a two-level atmospheric general circulation model developed by Mintz and Arakawa is used as the application problem to be implemented on the associative processor. The specific problems which arise in the implementation of the general circulation model on the associative processor are discussed and some solutions to these problems are suggested. Dissert. Abstr.

N75-23004# World Meteorological Organization, Geneva (Switzerland).
PHYSICAL AND DYNAMIC CLIMATOLOGY: PROCEEDINGS
Leningrad Gidrometeoizdat 1974 402 p Presented at Symp. on Phys. and Dyn. Climatol., Leningrad, Aug. 1971 Sponsored in part by Intern. Assoc. of Meteorol. and Atmospheric Phys. (WMO-347) Avail: NTIS HC $10.50

Papers presented at the conference are given. Topics discussed include the problems of the earth's energetic balance, physics of microclimate, local climate, numerical modelling of climates, satellite climatology, general atmospheric circulation, climate changes, man's impact on climate, solar radiation, the global cooling effect of aerosols, and atmospheric turbulences. For individual titles, see N75-23005 through N75-23037.

N75-23005 Main Geophysical Observatory, Leningrad (USSR).
PROBLEMS OF STUDYING THE ENERGY BALANCE OF THE EARTH
M. I. Budyko *In* WMO Phys. and Dyn. Climatol. 1974 p 12-25 refs (For availability see N75-23004 14-47)

Results are given of investigations conducted on the earth's heat balance. Topics discussed include the determination of heat balance components, temporal and spatial variations of components, use of material on energy balance to study the laws governing the climate of large territories, and the effect of climatic factors on different nonmeteorological natural processes (which depend on the transformations of solar energy on the earth's surface, in the atmosphere, and in the hydrosphere). M.J.S.

N75-23006 Academy of Sciences (USSR), Moscow. Inst. of Geography.
SOME ASPECTS OF PHYSICAL PHYTOCLIMATOLOGY
Ju. L. Rauner *In* WMO Phys. and Dyn. Climatol. 1974 p 28-41 refs (For availability see N75-23004 14-47)

Processes are discussed of physical interaction between phytocenosis of the ecological system and the lowest layers of the atmosphere (particularly where they are in contact with and partly inside the upper boundary of the vegetation cover). Complex heat balance measurements were carried out which include (1) actinometric measurements of fluxes of total radiation, heat radiation, and active photosynthetic radiation; (2) measurements of the gradients of temperature, humidity, wind speed, and temperature of the soil surface and upper soil layers; (3) measurements of evaporation from the soil, interception of precipitation, soil moisture; and (4) determination of the layer distribution of leaf or needle areas. Phytometric characteristics of the vegetative cover are included along with turbulent exchanges within the plant canopy. M.J.S.

N75-23007 Main Geophysical Observatory, Leningrad (USSR).
USE OF RADIATION CHARACTERISTICS FOR ESTIMATION OF LIGHT CLIMATE
N. P. Rusin, E. A. Poljakova, and O. D. Barteneva *In* WMO, Phys. and Dyn. Climatol. 1974 p 42-47 (For availability see N75-23004 14-47)

The light equivalent is described as the ratio of the value of illumination in thousands of luxes to the simultaneous value of radiation. Data are given on the values of the light equivalent for direct, total, and diffuse radiation depending on solar elevation and cloudiness. Based on these data, the climatic normals of the total and diffuse illumination of a horizontal surface were obtained for 145 points evenly distributed over the territory of the U.S.S.R., for five actinometric times, as well as the mean daily normals for the middle of every month. M.J.S.

N75-23008 Institut Royal Meteorologique de Belgique, Brussels.
DISTRIBUTION OF SOLAR RADIATION IN BELGIUM
R. Dogniaux *In* WMO Phys. and Dyn. Climatol. 1974 p 48-52 (For availability see N75-23004 14-47)

Global solar radiation was estimated from the duration of sunlight, and was used to outline a regional radiation climate in a country. The Angstrom formula was used to connect the global radiation to other meteorological parameters, and the results are presented. Seasonal and annual variations of sunlight duration and of irradiance are given. M.J.S.

N75-23009 Bergen Univ. (Norway). Inst. of Geophysics.
PHYSICS OF LOCAL AND MICROCLIMATE
K. Utaaker *In* WMO Phys. and Dyn. Climatol. 1974 p 53-74 refs (For availability see N75-23004 14-47)

The physical laws which control the exchange processes between the earth's surface and the atmosphere are found to be the same everywhere, but the changes they cause in the meteorological elements in the ground layer of the air and in the topsoil are quantitatively different under different climatic and physiographical conditions. The characteristics of the microclimate and the topoclimate are determined by the macroclimatic conditions, the topography of the land, and the state of the active surface and the subsurface layer. Other topics discussed include energy balance at the surface, radiation distribution on slopes, heat transfer, local winds, effects of local air flows on air temperature, and the effects of landscape on precipitation. M.J.S.

N75-23010 Ludwig-Maximilians-Universitat, Munich (West Germany). Meteorological Inst.
TURBULENT ENERGY FLUX AND EDDY DIFFUSIVITY
H. Kraus *In* WMO Phys. and Dyn. Climatol. 1974 p 75-84 refs (For availability see N75-23004 14-47)

Formulas for the vertical wind profile and the eddy diffusivities are derived from the turbulent energy budget. Problems are considered which arise in treating the vertical flux of turbulent energy. Under certain conditions, this flux is found to be as important as the vertical flux of the kinetic energy of mean motion in characterizing the dynamic structure of a boundary layer. M.J.S.

N75-23011 Institute of Experimental Meteorology, Obninsk (USSR).
SOME CHARACTERISTICS OF THE TEMPERATURE CONDITIONS IN THE LOWER ATMOSPHERE AS OBSERVED ON A 300 METRE METEOROLOGICAL TOWER
G. B. Mashkova *In* WMO Phys. and Dyn. Climatol. 1974 p 85-94 refs (For availability see N75-23004 14-47)

The daily range of air temperature in the lower 300 m layer of the atmosphere was obtained from observational data over a number of years. Vertical temperature profiles were examined which depended on the time of day and the stability of the surface layer of 0.5 to 10 m. It was found that (1) under the conditions of the central regions of the European territory of the U.S.S.R., the diurnal variation of air temperature is significant throughout the lower 300 m of the atmosphere, with the greatest vertical gradients being observed in the lower 100 m; (2) the vertical temperature gradient equals 0.76-0.85 C/100 m in the layer 25-301 m if the stability is close to neutral in the surface layer; and (3) the height up to which the vertical temperature gradient exceeds the adiabatic lapse rate increases with the instability in the surface layer. M.J.S.

N75-23012 Norwegian Meteorological Inst., Blindern.
LOCAL SHOWER CLIMATOLOGY BASED ON RADAR OBSERVATIONS
A. Moene *In* WMO Phys. and Dyn. Climatol. 1974 p 95-98 (For availability see N75-23004 14-47)

The observations of the summer shower activity in the Oslo, Norway area in the period 1957-1960 are discussed. Results of the observations are given along with the mean potential maximum temperatures on the days with observed shower activity. M.J.S.

N75-23013 Ukrainian Scientific Hydrometeorological Inst. (USSR).
THE SIGNIFICANCE OF THE COMPONENTS OF HEAT AND WATER BALANCES IN THE FORMATION OF MICRO AND LOCAL CLIMATE
A. R. Konstantinov, L. I. Sakaly, and L. S. Daigot *In* WMO Phys. and Dyn. Climatol. 1974 p 99-105 refs (For availability see N75-23004 14-47)

A heat balance equation is given for the process of radiant energy transformation at the underlying surface level. Radiation balance, loss of heat due to evaporation, turbulent heat exchange, and heat exchange in the soil are taken into consideration in this equation. Other topics discussed include the relationship between monthly values of temperature and air humidity and

values of radiation balance and heat loss during evaporation, eddy coefficients, the effect of wind speed on radiation balance, and annual averages of precipitation. M.J.S.

N75-23014 Academy of Sciences (USSR), Moscow. Inst. of Atmospheric Physics.
GLOBAL INVARIANTS OF ATMOSPHERIC MOTIONS
A. M. Obukhov *In* WMO Phys. and Dyn. Climatol. 1974 p 106-112 refs (For availability see N75-23004 14-47)

The calculation of global invariants of atmospheric motions is discussed along with the computation of distribution functions of atmospheric mass. Nonlinear models of atmospheric circulation were constructed with three degrees of freedom described by hydrodynamic equations, and the equations of motion for the model are given. The model was used to investigate the mechanism of baroclinic instability and the existence of various circulation patterns with the same external drive. M.J.S.

N75-23015 National Oceanic and Atmospheric Administration, Silver Spring, Md. Geophysical Fluid Dynamics Lab.
SEASONAL VARIATION OF CLIMATE IN A TIME-INTEGRATION OF A MATHEMATICAL MODEL OF THE ATMOSPHERE
S. Manabe, J. L. Holloway, Jr., and D. G. Hahn *In* WMO Phys. and Dyn. Climatol. 1974 p 113-122 refs Prepared in cooperation with Princeton Univ. (For availability see N75-23004 14-47)

The seasonal variation of climate was simulated by a time-integration of a system of prognostic equations, i.e., the equations of motions, the thermodynamical equations, the hydrologic equations for atmospheric water vapor, and the schemes for determining soil moisture and snow cover. The computational domain covers the entire earth's surface. Preliminary results from an analysis of the seasonal variation of the model climate are presented. It is shown that the model successfully simulates the reversal of the direction of the stratospheric zonal wind from summer to winter, and that the polar night jet stream is too intense and is located at too low a latitude. The seasonal variation of the thermal structure of the stratosphere as well as that of the troposphere is realistic except that the temperature of the polar night is too low. A preliminary analysis of the model indicates that the large scale eddies transport heat away from the equator, and are therefore partly responsible for maintaining the low temperatures at the equatorial tropopause.
Author

N75-23016 Main Geophysical Observatory, Leningrad (USSR).
NUMERICAL MODELS FOR THE STUDY OF CLIMATE
M. E. Shvetz and M. I. Yudin *In* WMO Phys. and Dyn. Climatol. 1974 p 124-130 refs (For availability see N75-23004 14-47)

Two numerical models were developed for studying existing climate, its natural variations, and the influence of man on climate. One is a deterministic model, and the other is a hydrodynamic-statistical model. The empirical data on energy transformation in the atmosphere, and energetic properties of the atmosphere in the hydrodynamical model of general circulation are discussed. Other topics discussed include radiation influxes, transformation of potential energy into kinetic energy, the Laplace equation, and energy dissipation. M.J.S.

N75-23017 Arizona Univ., Tucson. Inst. for Atmospheric Physics.
A NEW CLIMATIC MODEL OF THE EARTH: ATMOSPHERE SYSTEM
W. D. Sellers *In* WMO Phys. and Dyn. Climatol. 1974 p 131-135 refs (For availability see N75-23004 14-47)
(Contract DAHC04-70-C-0038)

An annual model of the energy balance of the earth-atmosphere system which was developed earlier was modified by including features of the atmospheric circulation, such as differences between land and water, and month-to-month variations. The basic equation used is a thermodynamic energy equation integrated from that depth in the soil or water where significant vertical heat transfer ceases to the top of the atmosphere, and averaged over time (one month). M.J.S.

N75-23018 Main Geophysical Observatory, Leningrad (USSR).
A SIMPLIFIED NUMERICAL MODEL OF THE THERMAL REGIME OF THE ATMOSPHERE
L. S. Gandin *In* WMO Phys. and Dyn. Climatol. 1974 p 137-150 refs (For availability see N75-23004 14-47)

Numerical experiments conducted with a simplified atmospheric model are described. The model was modified in order to investigate the role of heat influx in the formation of atmospheric temperature regime. Topics discussed include equations for the model and symbols, inertial invariants, numerical integration methods, integration of the inertial model equations, atmospheric heat inflow, integration with the fixed field the stream function, and integration from the state of rest. M.J.S.

N75-23019 Leningrad (A. A. Zhdanov) State Univ. (USSR).
SATELLITES AS A SOURCE OF METEOROLOGICAL INFORMATION
K. Ya. Kondratyev *In* WMO Phys. and Dyn. Climatol. 1974 p 152-166 refs (For availability see N75-23004 14-47)

Trends of satellite investigations are discussed along with achievements and operational problems. Meteorological satellites were used to investigate cloud cover, ice cover, snow cover, wind velocity, atmospheric circulation, precipitation, temperature fields of the underlying surface, and the earth's heat budget.
M.J.S.

N75-23020* Ruhr Univ., Bochum (West Germany).
CLIMATOLOGICAL STUDIES OF THE EARTH'S RADIATION BUDGET AND ITS VARIABILITY WITH MEASUREMENTS OF THE SATELLITE NIMBUS 3
E. Raschke and T. VonderHaar *In* WMO Phys. and Dyn. Climatol. 1974 p 168-179 refs Sponsored in part by Fed. Min. of Educ. and Sci. Prepared in cooperation with Colo. State Univ. (For availability see N75-23004 14-47)
(Grant NGR-06-022-102)

Measurements of emitted long-wave radiation and reflected solar radiation were obtained over the entire globe from the meteorological satellite Nimbus III during 10 semimonthly periods of 1969 and 1970 covering a full annual cycle. Analyses of these measurements resulted in values for various scales for the radiation balance, the planetary albedo, and the outgoing long-wave radiation flux, and in geographical distributions of their averages and parameters describing their variability. Some examples obtained from measurements during the semimonthly period from 1-15 July 1969 are presented. They show the value of quantitative radiometric measurements as climatological descriptors as well as for studies of atmospheric energetics.
Author

N75-23021 Bonn Univ. (West Germany). Inst. of Meteorology.
TROPICAL CIRCULATION PATTERNS: RECENT ASPECTS
H. Flohn *In* WMO Phys. and Dyn. Climatol. 1974 p 180-198 refs (For availability see N75-23004 14-47)

The longitudinal differentiation of the tropical circulation patterns is outlined based on actual data and heat budget considerations. The following major concepts which describe the three dimensional flow pattern in the tropical latitudes are discussed: (1) Hadley and anti-Hadley cells; (2) cold sources along the Equator; (3) a zonal 'Walker' circulation; (4) interactions between tropical and extratropical patterns; and (5) the ultra-long wave concept. J.M.S.

N75-23022 Main Geophysical Observatory, Leningrad (USSR).
THE HYDROLOGICAL CYCLE IN THE ATMOSPHERE
O. A. Drozdov *In* WMO Phys. and Dyn. Climatol. 1974 p 199-204 refs (For availability see N75-23004 14-47)

A general theory of the hydrological cycle is developed on the basis of numerical solution of vapor transfer equations. A number of hydrological cycle characteristics are obtained in a semi-empirical way, utilizing various lines of investigations. Only those aspects of the problem that are immediately associated with the hydrological cycle of the atmosphere are dealt with, while questions concerning the heat transfer accompanying this process are not considered. The following characteristics are discussed: formation of precipitation; the relationship between evaporation and radiation balance; and the proportion of water vapor at different origins.
Author

N75-23023 Academy of Sciences (USSR), Moscow. Inst. of Geography.
FLUCTUATIONS OF ATMOSPHERIC CIRCULATION AND CLIMATIC REGIME OF THE EARTH
A. S. Chaplygina *In* WMO Phys. and Dyn. Climatol. 1974 p 205-213 refs (For availability see N75-23004 14-47)

The dynamics of climate based on the analysis of the long-period trend of circulation processes are studied. An integral mechanism of atmospheric circulation covering at least a whole hemisphere is used to relate separate climatic characteristics obtained for different areas and regions and at the same time 'regulate' climatic diagrams in accordance with relationships having a physical basis, typical macroscale circulation mechanisms. Author

N75-23024 Institute of Aeroclimatology, Moscow (USSR).
MACROTURBULENCE OF HORIZONTAL MOTION OVER THE USSR
I. G. Guterman *In* WMO Phys. and Dyn. Climatol. 1974 p 214-225 refs (For availability see N75-23004 14-47)

The fundamental, turbulent, and mean fluxes of heat, moisture, energy, and zonal angular momentum over the U.S.S.R. are empirically studied. Horizontal macroturbulent exchange coefficients are evaluated from the empirical data. The ratio of the standard vector deviation of winds to the module of resultant wind velocity is considered to obtain an idea of the relative characteristics of macroturbulence in the field of velocity. Author

N75-23025 Main Geophysical Observatory, Leningrad (USSR).
THEORY OF CIRCULATION AND THERMAL REGIME OF THE MESOSPHERE
L. R. Rakipova and L. K. Efimova *In* WMO Phys. and Dyn. Climatol. 1974 p 226-232 refs (For availability see N75-23004 14-47)

The existence and influence of a chemical heat flux in the mesosphere are used to explain the characteristic features of the circulation and thermal regime of the mesophere. Author

N75-23026 Meteorological Office, Bracknell (England).
CLIMATES AND CIRCULATION REGIMES DEVELOPED OVER THE NORTHERN HEMISPHERE DURING AND SINCE THE LAST ICE AGE
H. H. Lamb *In* WMO Phys. and Dyn. Climatol. 1974 p 233-261 refs (For availability see N75-23004 14-47)

The history of prevailing temperatures over the last 50,000-10,000 years is examined along with temperature data derived since the introduction of the thermometer. Annual and longer-term variations are assessed. The main characteristics of the atmospheric circulation regimes that ushered in the last ice age are described based on empirical temperature data. The apparently prevailing circulation regimes representing equilibrium conditions around the time of maximum glaciation, during the warmest post-glacial era, and at several other stages are systematically reconstructed from the Northern Hemisphere temperature field at each stage. Author

N75-23027 Maryland Univ., College Park. Dept. of Geophysical Sciences.
MAN MADE CLIMATIC CHANGES
H. E. Landsberg *In* WMO Phys. and Dyn. Climatol. 1974 p 262-303 refs (For availability see N75-23004 14-47) (Grants NSF GA-1104; NSF GA-13353)

Natural climatic fluctuations characterized as a 'noise' spectrum are discussed along with climatic modifications produced by human activity. It is indicated that man has produced local climatic changes and is on the verge of producing regional changes. Urbanization and the superabundance of nuclei and dust produced by human activity are considered to have the greatest effect on climate. It is concluded that all atmospheric changes should be monitored. J.M.S.

N75-23028 Environmental Data Service, Silver Spring, Md.
THE GLOBAL COOLING EFFECT OF INCREASING ATMOSPHERIC AEROSOLS: FACT OR FICTION
J. M. Mitchell, Jr. *In* WMO Phys. and Dyn. Climatol. 1974 p 304-319 refs (For availability see N75-23004 14-47)

Criteria are proposed for distinguishing between a net cooling and a net warming effect on climate associated with an increased particle loading of the atmosphere. Various possible feedback effects of aerosol on global cloudiness and on the contribution of clouds to the planetary albedo are included. It is concluded that a net cooling effect of increasing aerosols is not to be assumed unless the added aerosols are known to be appreciably less efficient as absorbers of solar radiation than as backscatters of solar radiation. Based on a very small number of available measurements on man-made aerosols, such aerosols appear to possess absorption efficiencies of sufficient magnitude to place them in the category of ambiguous climatic response. Author

N75-23029 Main Geophysical Observatory, Leningrad (USSR).
ON THE STRUCTURE OF THE PRESENT TIME CLIMATIC FLUCTUATIONS
O. A. Drozdov, L. G. Polozova, and E. S. Rubinstein *In* WMO Phys. and Dyn. Climatol. 1974 p 320-327 refs (For availability see N75-23004 14-47)

Climatic fluctuations and changes caused by changes in the climate-forming factors of solar radiation, physico-geographical conditions, and atmospheric circulation are investigated. A secular cycle associated with a similar cycle of solar activity taking place under the influence of the powerful inertia system of the world ocean is discussed along with a secular march of temperature. The present warming trend is considered the result of these phenomena. Various methods used to establish climatic change are described. J.M.S.

N75-23030 Academy of Science of the Georgian SSR, Tbilisi (USSR). Inst. of Geography.
THE POLLUTION OF THE EARTH'S ATMOSPHERE AND CHANGES IN ITS GASEOUS COMPOSITION
F. F. Davitaya *In* WMO Phys. and Dyn. Climatol. 1974 p 328-335 refs (For availability see N75-23004 14-47)

The dynamics of atmospheric composition are discussed in terms of increasing air pollution due to industrial wastes and the destruction of vegetation, increasing CO_2 content, and decreasing oxygen content due to the burning of fossil fuels. It is recommended that (1) vegetation be restored to purify the atmosphere through absorption of aromatic hydrocarbons; and (2) solar energy be utilized as a means of preserving the gaseous composition of the atmosphere. J.M.S.

N75-23031 Moscow Inst. of Geodesy (USSR).
THE INFLUENCE OF THE RADIATION BUDGET ON THE ZONAL TEMPERATURE
A. A. Dmitriev *In* WMO Phys. and Dyn. Climatol. 1974 p 336-338 refs (For availability see N75-23004 14-47)

A model which divides the hemisphere into three belts was used to investigate the influence of the heat capacity of the oceans on long period climatic fluctuations, associated with fluctuations of the surface radiation budget. Results are extended to short period processes to forecast changes in the depth of tropical hurricanes. J.M.S.

N75-23032 Academy of Sciences (USSR), Moscow. Inst. of Geography.
THE RELATIONSHIPS OF GEOPHYSICAL SYSTEMS FORMING THE CLIMATE ON VARIOUS TIME SCALES
V. Ya. Sergin and S. Ya. Sergin *In* WMO Phys. and Dyn. Climatol. 1974 p 339-346 refs (For availability see N75-23004 14-47)

A mathematical model of the system 'earth's surface-atmosphere' is formulated, expressing the totality of climate forming processes along with their interconnections and feedbacks. Principal processes considered are: changes in solar radiation; changes in cloudiness; global evaporation; water vapor content of the air; changes in the earth's albedo caused by changes in ocean area and in the area of continental and sea ice. The dynamics of the system is investigated and found to be self-oscillating. Results indicate that the thermodynamic mechanism examined explains the intensive climatic and glaciation fluctuations during cold periods as well as the absence of sharp climatic changes during warm periods. J.M.S.

N75-23033 Environmental Data Service, Silver Spring, Md.
THE STOCHASTIC ASPECT OF DYNAMIC CLIMATOLOGY
H. C. S. Thom *In* WMO Phys. and Dyn. Climatol. 1974

p 347-350 refs (For availability see N75-23004 14-47)

Stochastic processes which operate on time series of data are applied to climatology. The climatological series is shown to be represented by an ideal random series and is defined as a sample series consisting of one meteorological measurement having the same characteristic each year and observed by a stationary observation system. It is shown that the random nature of climatological series is a reflection of a fundamental property of the true model for climatology: that it is a set of transformations of two dimensional space into time. A model of the sun-earth is developed and used to demonstrate the stationarity of the climatological series. J.M.S.

N75-23034 Main Geophysical Observatory, Leningrad (USSR).
ON SOME RADIATIVE FACTORS OF CLIMATIC CHANGEABILITY
T. V. Pokrovskaya, B. I. Sazonov, and L. P. Spirina *In* WMO Phys. and Dyn. Climatol. 1974 p 351-358 refs (For availability see N75-23004 14-47)

Changes in the solar constant due to the level of solar activity and the part played by volcanic eruptions in planetary temperature changes are considered. Maps are compiled to demonstrate the effects of volcanic activity on temperature fluctuations. It is indicated that a large number of sunspots and volcanic dust in the stratosphere promote a decrease of the solar radiation influx to the earth's surface and decrease of the temperature in the global scale. J.M.S.

N75-23035 Universidad Nacional Autonoma de Mexico, Villa Obregon. Inst. de Geofisica.
THERMODYNAMIC APPROACH FOR THE STUDY OF CLIMATIC CHANGES
J. Adem *In* WMO Phys. and Dyn. Climatol. 1974 p 359-389 refs (For availability see N75-23004 14-47)

A time-averaged thermodynamic model of the atmosphere-ocean-continent system is developed and applied to the study of climatic changes. The numerical experiments included estimates for the Northern Hemisphere, for January and July, of the fluctuations from the normal climatic temperature and variations in the associated heat sources and sinks, due to assumed modifications of the solar constant, the surface albedo, the cloud cover, the absorption of short-wave radiation by the atmosphere, and the width of Simpson's atmospheric radiation window. Results are presented. Author

N75-23036 Institut Royal Meteorologique de Belgique, Brussels.
STATISTICAL ANALYSIS OF TEMPERATURE AND RAINFALL DATA AT BRUSSELS-UCCLE FROM 1833 TO 1969
R. Sneyers *In* WMO Phys. and Dyn. Climatol. 1974 p 390-392 refs (For availability see N75-23004 14-47)

Monthly, seasonal, and annual values of temperature and rainfall at Brussels-Uccle are analyzed. The series are tested for randomness. It is concluded that rainfall is stable, but temperature rises during spring and autumn. J.M.S.

N75-23037 Zentralanstalt fuer Meteorologie und Geodynamik, Vienna (Austria).
CLIMATIC FLUCTUATIONS IN THE NORTH-EASTERN PRE-ALPINE REGION
K. Cehak *In* WMO Phys. and Dyn. Climatol. 1974 p 393-400 refs (For availability see N75-23004 14-47)

Climatic fluctuations observed at climatological stations at Kremsmunster and Vienna are investigated to determine if they are governed by stochastic processes or are purely random. The variance-spectra of the series of temperature and precipitation totals of the climatological stations are calculated by first finding the autocorrelation functions. The variance-spectra are then derived by a Fourier analysis using the Hanning filter. Results are discussed. J.M.S.

N75-23038# Joint Publications Research Service, Arlington, Va.
FORMATION OF CLEARING ZONES IN CLOUDS AND FOGS
A. V. Korotin, D. Ye. Svetogorov, Yu. S. Sedunov, and L. P. Semenov 28 Apr. 1975 8 p refs Transl. into ENGLISH from Dokl. Akad. Nauk Arm. SSR (USSR), v. 220, no. 4, 1975 p 829-832 (JPRS-64640) Avail: NTIS

The intensive evaporation of droplets and the formation of areas free of water aerosols are discussed in terms of the interaction between electromagnetic radiation and the cloud medium. The equations for droplet evaporation, and initial boundary conditions are given, and the distribution functions characteristic for clouds are derived. It is concluded that aerosol movement limits the penetration of the clearing zone into the cloud. F.O.S.

N75-23039# Joint Publications Research Service, Arlington, Va.
METEOROLOGICAL INSTRUMENTS
25 Apr. 1975 44 p Transl. into ENGLISH from MPI Bull. (Moscow), no. 12, 1971 p 1-21 (JPRS-64619) Avail: NTIS HC $3.75

Soviet meteorological and oceanographic instruments are described. For individual titles, see N75-23040 through N75-23046.

N75-23040 Joint Publications Research Service, Arlington, Va.
A RELIABLE AID FOR METEOROLOGISTS
In its Meteorol. Instr. (JPRS-64619) 25 Apr. 1975 p 1-5 Transl. into ENGLISH from MPI Bull. (Moscow), no. 12, 1971 p 2-4 (For availability see N75-23039 14-47)

The meteorological radar station which operates over a radius of 300 km is described. It provides observations of clouds, precipitation, and the intensity of turbulence by an echo-image device. F.O.S.

N75-23041 Joint Publications Research Service, Arlington, Va.
IMMEDIATE AND EFFECTIVE INTERVENTION
Y. Serioguine *In its* Meteorol. Instr. (JPRS-64619) 25 Apr. 1975 p 6-12 Transl. into ENGLISH from MPI Bull. (Moscow), no. 12, 1971 p 5-8 (For availability see N75-23039 14-47)

A method for impeding the development of hail is described. Antiaircraft guns are used to explode projectiles containing lead or silver iodide in hail-bearing clouds. Results indicate that this is an effective method for protecting agricultural products from hail losses. F.O.S.

N75-23042 Joint Publications Research Service, Arlington, Va.
HOW TO MEASURE THE VELOCITIES OF CURRENTS
P. Bourtsev *In its* Meteorol. Instr. (JPRS-64619) 25 Apr. 1975 p 13-14 Transl. into ENGLISH from MPI Bull. (Moscow), no. 12, 1971 p 8 (For availability see N75-23039 14-47)

Hydrometric current meters are briefly described. F.O.S.

N75-23043 Joint Publications Research Service, Arlington, Va.
A SECTIONAL VIEW OF THE ATMOSPHERE EQUIPMENT FOR SOUNDING TEMPERATURE AND WIND
A. Konzenkov *In its* Meteorol. Instr. (JPRS-64619) 25 Apr. 1975 p 15-20 Transl. into ENGLISH from MPI Bull. (Moscow), no. 12, 1971 p 9-11 (For availability see N75-23039 14-47)

A radio sounding system is described for obtaining atmospheric pressure, temperature, humidity, and wind velocity and direction. The equipment for the radiosonde, ground radar, and monitoring and measurement are included. The technical characteristics of the system are given. F.O.S.

N75-23044 Joint Publications Research Service, Arlington, Va.
METEOROLOGICAL BULLETINS FROM 100 KILOMETERS ALTITUDE
D. Patapenko *In its* Meteorol. Instr. (JPRS-64619) 25 Apr. 1975 p 21-28 Transl. into ENGLISH from MPI Bull. (Moscow), no. 12, 1971 p 12-15 (For availability see N75-23039 14-47)

The M-100 meteorological rocket is briefly described as an unguided, two stage, solid fuel rocket, which is launched at a vertical angle. The telemetry is also described. F.O.S.

N75-23045 Joint Publications Research Service, Arlington, Va.
ON THE SEAS AND THE OCEANS
B. Maximov *In its* Meteorol. Instr. (JPRS-64619) 25 Apr. 1975 p 29-32 Transl. into ENGLISH from MPI Bull. (Moscow), no. 12, 1971 p 16-17 (For availability see N75-23039 14-47)

Soviet instruments for measuring ocean swell and currents are briefly described. F.O.S.

N75-23046 Joint Publications Research Service, Arlington, Va.
AUTOMATED OBSERVATION
V. Babarykine *In its* Meteorol. Instr. (JPRS-64619) 25 Apr. 1975 p 33-42 Transl. into ENGLISH from MPI Bull. (Moscow), no. 12, 1971 p 18-21 (For availability see N75-23039 14-47)

The M-107 automated meteorological weather station which can operate for more than a year without human intervention is described. Electric power for the telemetry system is obtained from a wind generator with storage battery buffers. Besides making the scheduled hourly observations, the station surveys parameters, and when their values exceed limits, special observations are transmitted. F.O.S.

N75-23047*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
EFFECT OF MOLECULAR ANISOTROPY ON THE INTENSITY AND DEGREE OF POLARIZATION OF LIGHT SCATTERED FROM MODEL ATMOSPHERES
Om P. Bahethi (Computer Sci. Corp.) and Robert S. Fraser Apr. 1975 28 p refs
(NASA-TM-X-70879; X-910-75-52) Avail: NTIS HC $3.75 CSCL 20F

Computations of the intensity, flux, degree of polarization, and the positions of neutral points are presented for models of the terrestrial gaseous and hazy atmospheres by incorporating the molecular anisotropy due to air in the Rayleigh scattering optical thickness and phase matrix. Molecular anisotropy causes significant changes in the intensity, flux and the degree of polarization of the scattered light. The positions of neutral points do not change significantly. When the Rayleigh scattering optical thickness is kept constant and the molecular anisotropy factor is included only in the Rayleigh phase matrix, the flux does not change and the intensity and positions of neutron points change by a small amount. The changes in the degree of polarization are still significant. Author

N75-23048# National Weather Service, Silver Spring, Md.
NUMERIKAL WEATHER PREDICTION ACTIVITIES, NATIONAL METEOROLOGICAL CENTER, SECOND HALF 1974
1974 26 p
Avail: NTIS HC $3.75

Models are presented describing several different techniques in predicting the weather. The conversion of programmed codes is reported. M.C.F.

N75-23049# Battelle Pacific Northwest Labs., Richland, Wash.
ENTRAINMENT OF TRACERS INTO CONVECTIVE CLOUDS AT 10 TO 13.5 THOUSAND FEET NEAR ST. LOUIS
J. A. Young, T. M. Tanner, C. W. Thomas, and N. A. Wogman 1974 16 p refs Presented at the Precipitation Scavenging Conf., Champaign, Ill., 13 Oct. 1974
(Contract AT(45-1)-1830)
(BNWL-SA-5116; Conf-741003-10) Avail: NTIS HC $3.25

Inert tracers were released sequentially near the edges of convective clouds to determine whether air was being entrained into the clouds at these altitudes, and to determine the extent to which the particulate contaminants in the entrained air were being scavenged by the precipitation. The results indicate that the tracers were nearly completely scavenged. The tracers spread from cell to cell, and each tracer appeared in comparable amounts in the precipitation from both cells. Measurable concentrations of the tracers were present in precipitation at the eastward edge of the precipitation network 20 to 30 miles downwind of the tracer releases, indicating that the tracers were also present in precipitation falling further downwind outside the network.
Author (NSA)

N75-23050# Battelle Pacific Northwest Labs., Richland, Wash.
PRECIPITATION SCAVENGING IN A SQUALL LINE: NUMERICAL EXPERIMENTATION
Carl Hane 1974 12 p ref Presented at the Precipitation Scavenging Conf., Champaign, Ill., 13 Oct. 1974
(Contract AT(45-1)-1830)
(BNWL-SA-5084; Conf-741003-9) Avail: NTIS HC $3.25

Estimates of internal cloud circulation patterns are applied to study incorporation of pollutants into clouds at various locations relative to the cloud. Various environmental profiles are considered. The redistribution of pollutants by the cloud air motions with no interaction considered among pollutant, rain, and cloudwater is investigated. The interaction of pollutant and rainwater and the resulting distribution of pollutant concentrations in the atmosphere and in the fallen rainwater are studied. The inclusion of pollutant in the cloudwater as condensation nuclei is considered. A two dimensional time-dependent squall line thunderstorm model is used to calculate air motions and other cloud properties. NSA

N75-23051# World Meteorological Organization, Geneva (Switzerland).
CLIMATE UNDER GLASS
J. Seemann 1974 49 p refs
(WMO-373; TN-131; ISBN-92-63-10373-9) Avail: NTIS HC $3.75; WMO, Geneva

The heat and moisture balances of the air and soil in naturally heated greenhouses, and the effects of the diurnal and seasonal changes on the microclimate are discussed. Illustrative comparisons are made between meteorological conditions inside and outside the greenhouse. Methods and techniques for the control of greenhouse climates are reviewed in detail, together with the various types of installations available for the purpose. The regulation of lighting and temperature, the methods of shading and ventilation, and the effects of water spraying are discussed. An extensive bibliography is included. ESRO

N75-23052# Institut Royal Meteorologique de Belgique, Brussels.
CLIMATOLOGICAL OBSERVATIONS Monthly Bulletin, Nov. 1974 [OBSERVATIONS CLIMATOLOGIQUES BULLETIN MENSUEL, NOVEMBRE 1974]
Nov. 1974 15 p In FRENCH and DUTCH
Avail: NTIS HC $3.25

Meteorological parameters observed at different Belgian weather stations during November 1974 are given. ESRO

N75-23053# Institut Royal Meteorologique de Belgique, Brussels.
CLIMATOLOGICAL OBSERVATIONS Monthly Bulletin, Dec. 1974 [OBSERVATIONS CLIMATOLOGIQUES BULLETIN MENSUEL, DECEMBRE 1974]
Dec. 1974 16 p In FRENCH and DUTCH
Avail: NTIS HC $3.25

Meteorological parameters observed at different Belgian weather stations during December 1974 are given. ESRO

N75-23054# Institut Royal Meteorologique de Belgique, Brussels.
SYNOPTIC OBSERVATIONS Monthly Bulletin, Jan. 1974 [OBSERVATIONS SYNOPTIQUES BULLETIN MENSUEL, JANVIER 1974]
Jan. 1974 31 p In FRENCH and DUTCH
Avail: NTIS HC $3.75

Synoptic measurements made at different Belgian weather stations in January 1974 are given. ESRO

N75-23055# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
THE 14810 LANCE MISSILE NO. 2562, ROUND NO. 236 APT (18 JULY 1974) Meteorological Data Report
Jul. 1974 30 p
(DA Proj. 1T6-65702-D-127)
(AD-A003201; DR-855) Avail: NTIS CSCL 04/2

Meteorological data gathered for the launching of 14810 Lance, Missile Number 2562, Round Number 236 APT, are presented in tabular form. GRA

N75-23056# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
THE 11602 LANCE, MISSILE NO. 2791, ROUND NO. 234 RSL (17 JULY 1974) Meteorological Data Report
Jul. 1974 73 p
(DA Proj. 1T6-65702-D-127)
(AD-A003200; DR-853) Avail: NTIS CSCL 04/2

Meteorological data gathered for the launching of 11602 Lance, Missile Number 2791, Round Number 234 RSL, are presented in tabular form. GRA

N75-23057# California Univ., Los Angeles. Dept. of Meteorology.
PRELIMINARY STUDY OF THE ATMOSPHERIC CIRCULA-

TION DURING THE PERIOD PRECEEDING THE 1972 - 1973 EL NINO (A NORPAX CONTRIBUTION)
J. Bjerknes Dec. 1974 28 p. refs
(Contract N00014-69-A-0200-4044)
(AD-A006985) Avail: NTIS CSCL 04/2

The National Environmental Satellite Service (NESS) and the National Oceanic and Atmospheric Administration (NOAA) have jointly started issuing monthly averaged maps of streamfunctions at 700 mb and 200 mb elevation covering the global belt from 48 degrees N to 48 degrees S. The streamfunctions represent only the nondivergent part of the air flow. To obtain a further approximation to the real air motion, rather weak fields of convergent motion can be assumed to exist where the streamfunction showed cyclonic vorticity and divergent motion where the streamfunction is anticyclonic. With this in mind, one can explore the atmospheric circulation by studying the streamfunction maps, as demonstrated in the report. GRA

N75-23058# Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.
ANALYSIS OF A RADAR RAIN RETURN AT FREQUENCIES OF 9.375, 35, 70, AND 95 GHz
N. C. Currie, F. B. Dyer, and R. D. Hayes 1 Feb. 1975 103 p refs
(Contract DAAA25-73-C-0256)
(AD-A007254; GIT-A-1485-TR-2) Avail: NTIS CSCL 17/9

A series of measurements of radar backscatter from rain have been made at frequencies of 9.375, 35, 70, and 95 GHz. The geometry of the experiment and the equipment were chosen such as to provide data useful to the equipment designer in the choice of operating frequency for his particular mission. Amplitude statistics for both linear and circular polarization were obtained for rain rates between 1 mm/hr and 90 mm/hr. Non-coherent spectral measurements and correlation properties were investigated in detail as functions of frequency and rain rate. Limited comparisons are made between theory and experimental results and certain properties of the results are discussed in relation to the phenomenology of rain return. GRA

N75-23059# Mount Auburn Research Associates, Inc., Newton Upper Falls, Mass.
EFFECTS OF AIRPLANE FLOW FIELDS ON HYDROMETEOR CONCENTRATION MEASUREMENTS Final Report, 1 Jul. 1973 - 30 Nov. 1974
Hillyer G. Norment and Robert G. Zalosh 6 Dec. 1974 108 p refs
(Contract F19628-73-C-0114; AF Proj. 7605)
(AD-A006690; AFCRL-TR-74-0602) Avail: NTIS CSCL 04/2

A method is described by which concentration distortion of particulates of arbitrary sizes caused by airflow around airplane fuselages can be calculated. The method accounts for effects of: three-dimensional details of the fuselage shape on airflow, angle-of-attack on airflow, altitude, interaction of the particles with the airflow, and particle settling. It has been applied to hydrometeor sampling instruments on three cloud physics airplanes: Lockheed C130A and C130E transports, and a Cessna Citation jet. Detailed results for water drops and ice columns are presented. GRA

N75-23060# Defence Research Establishment Ottawa (Ontario).
CORRELATION ANALYSIS OF WIND AND ICE DRIFT DATA TAKEN AT LINCOLN BAY 1972
Victor Jones Nov. 1974 12 p ref
(AD-A007089; DREO-TN-74-34) Avail: NTIS CSCL 08/12

A set of programs were written to analyze wind and ice drift speed correlations in the data taken at Lincoln Bay in 1972. The maximum correlation for each station indicates that about 20% of the drift can be attributed to wind. The effects of time lag and Coriolis force were examined but due to the complexity of the problem no generalization on ice floe measurement could be made. GRA

N75-23061# Army Electronics Command, Fort Monmouth, N.J.
AN EVALUATION OF THE HYDROMETEOROLOGICAL GROUND TRUTH FACILITY AT WHITE SANDS MISSILE RANGE, NEW MEXICO
B. T. Miers and H. S. Oey Feb. 1975 35 p refs
(DA Proj. 1T1-62111-H-71A-272)
(AD-A007110; ECOM-5557) Avail: NTIS CSCL 04/2

Analysis of raingage and streamgage data from the hydrometeorological facility located on the Jornada Experimental Range is presented. It was found that rainfall and streamflow were highly influenced by the large changes in topography of the area, thereby making the estimation of rainfall from satellite data more difficult. Also, the gaging network was determined to be inadequate as a ground truth facility for meteorological satellites due to the spacing and areal extent of the instrumentation. The hydrographs derived from the data most closely fit a simple model derived by Reich. If studies in desert hydrology and rainfall patterns are to be continued, a larger area with more recording gages will be required. GRA

N75-23062# Texas Univ., El Paso. Dept. of Electrical Engineering.
AN ALL DIGITAL TTL ANEMOMETER SYSTEM Annual Report
Philip Jospeh and Fred Taylor Feb. 1975 76 p refs
(Contract DAAD07-74-C-0103)
(AD-A006866; SP1-75-DC-73; ECOM-75-2) Avail: NTIS CSCL 04/2

An all Digital Anemometer system has been developed. It will support up to 128 randomly accessed remote digital anemometer stations on an Asynchronous Communications line. A special purpose propeller driven digital encoder has been designed to convert wind speed into a digital format. Universal start, stop, clear, and programmed divisions can be performed under computer control. GRA

N75-23063# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
RADAR IN METEOROLOGY
V. D. Stepanenko 2 Jan. 1975 504 p refs Transl. into ENGLISH of the monograph "Radiolokatsiya v Meteorologii" USSR, no. 2, 1973 p 1-343
(AD-A007172; FTD-HC-23-943-74) Avail: NTIS CSCL 04/2

The following topics are discussed: Radiophysical properties of the troposphere; theory of radar detection of clouds and precipitation by means of meteorological radar operating on the centimeter and millimeter wave lengths, use of meteorological radar stations for the detection and investigation of clouds and phenomena associated with them; use of radar for detecting and studying objects in the troposphere which cannot be detected visually; determination of the intensity of precipitation and water contents of clouds by radar methods; use of optical locators in meteorology; acoustic-radar sounding of the atmosphere; fluctuations in the echo signals and the use of doppler radars for meteorological purposes; possibility of obtaining radar meteorological and hydrological data by means of artificial earth satellites; influence of meteorological conditions on the application of radar. G.G.

N75-22836 Joint Publications Research Service, Arlington, Va.
CALCULATING PRECIPITATION BY THE HYDRODYNAMIC MODEL OF THE ATMOSPHERE
V. M. Kadyshnikov *In its* Meteorol. and Hydrology, No. 2, 1975 (JPRS-64670) 1 May 1975 p 13-24 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 2, 1975 p 12-21 (For availability see N75-22834 14-42)

N75-22838 Joint Publications Research Service, Arlington, Va.
TIME OF COMMENCEMENT OF STRATIFORMIS CLOUD FORMATION
B. P. Kudryavtsev *In its* Meteorol. and Hydrology, No. 2, 1975 (JPRS-64670) 1 May 1975 p 35-43 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 2, 1975 p 30-36 (For availability see N75-22834 14-42)

N75-22839 Joint Publications Research Service, Arlington, Va.
HARMONIC ANALYSIS OF TIME SERIES OF THE MEAN MONTHLY VALUES OF METEOROLOGICAL ELEMENTS
N. K. Grib, L. V. Kotelnikova, and N. A. Lepekhina *In its* Meteorol. and Hydrology, No. 2, 1975 (JPRS-64670) 1 May 1975 p 44-52 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 2, 1975 p 37-43 (For availability see N75-22834 14-42)

N75-22840 Joint Publications Research Service, Arlington, Va.
CONSIDERATION OF MOISTURE WHEN CALCULATING THE HEIGHT OF THE CONVECTIVE LAYER
A. A. Zhelnin and A. P. Khain *In its* Meteorol. and Hydrology, No. 2, 1975 (JPRS-64670) 1 May 1975 p 53-57 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 2, 1975 p 44-47 (For availability see N75-22834 14-42)

N75-22847 Joint Publications Research Service, Arlington, Va.
APPLICATION OF QUEUEING THEORY TO THE ANALYSIS OF VARIATIONS OF THE WEATHER CONDITIONS ALONG THE LINE AT THE EARTH'S SURFACE
A. I. Tamazov *In its* Meteorol. and Hydrology, No. 12, 1975 (JPRS-64670) 1 May 1975 p 120-123 Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 12, 1975 p 99-101 (For availability see N75-22834 14-42)

N75-22848 Joint Publications Research Service, Arlington, Va.
DETERMINING THE DISPLACEMENT RATE OF ISOBARS
V. D. Volik and F. T. Doroshenko *In its* Meteorol. and Hydrology, No. 2, 1975 (JPRS-64670) 1 May 1975 p 124-147 Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 12, 1975 p 101-104 (For availability see N75-22834 14-42)

N75-22850 Joint Publications Research Service, Arlington, Va.
AGROMETEOROLOGICAL PECULIARITIES OF ANOMALOUS SPRINGS IN BELORUSSIA
L. K. Pyatovskaya *In its* Meteorol. and Hydrology, No. 2, 1975 (JPRS-64670) 1 May 1975 p 132-134 Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 12, 1975 p 106-107 (For availability see N75-22834 14-42)

N75-22854 Joint Publications Research Service, Arlington, Va.
USE OF THE DAVITAYA FIELD RAIN GAUGE AS A CUMULATING INSTRUMENT
N. N. Podgayskiy *In its* Meteorol. and Hydrology, No. 2, 1975 (JPRS-64670) 1 May 1975 p 152-153 Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 2, 1975 p 117-118 (For availability see N75-22834 14-42)

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N75-23064 Columbia Univ., New York.
MAGNETIC LINEATIONS AND PROBLEMS OF PLATE TECTONICS IN THE EASTERN PACIFIC Ph.D. Thesis
Ellen Mary Herron 1974 143 p
Avail: Contact author at Lamont Doherty Geological Observatory, Palisades, N. Y. 10964; Univ. Microfilms Order No. 74-28505

The Cenozoic history of the east central Pacific outlined by marine magnetic lineations records the complex interactions of several crustal plates: the growth of the main Pacific plate and the Antarctic plate; the demise of the Farallon plate; and the birth of four new plates; the large Nasca and Cocos plates, and the very small, but significant upper and lower plates. The studies progress from analysis of individual pairs of crustal plates to a synthesis of the relations between all plates which were active in the area. Two small crustal plates are identified, forming between the Pacific and Nasca plates, apparently the result of instability associated with the extremely rapid rate of separation of the Pacific and Nasca plates. Dissert. Abstr.

N75-23065*# Scientific Translation Service, Santa Barbara, Calif.
VARIATIONS IN THE RATIO IN VIVO-FLUORESCENCE/ALPHA-CHLOROPHYLL AND ITS APPLICATION TO OCEANOGRAPHY. EFFECT OF LIMITING DIFFERENT NUTRIENTS, OF NIGHT AND DAY AND DEPENDENCE ON THE SPECIES UNDER INVESTIGATION
Dolores Blasco Washington NASA May 1975 26 p refs Transl. into ENGLISH from Invest. Pesq. (Spain), v. 37, no. 3, Dec. 1973 p 533-556
(Contract NASw-2483)
(NASA-TT-F-16317) Avail: NTIS HC $3.75 CSCL 08A

Existing information on the fluorescence-chlorophyll alpha ratio is applied to biological oceanography. Studies are performed on variations in this ratio as a function of the limitation of different nutrients, the effect of light or darkness, and the status of the ocean phytoplankton population. Author

N75-23066# Joint Publications Research Service, Arlington, Va.
GEOPHYSICAL METHODS FOR STUDYING THE OCEAN
S. M. Zverev, ed. 28 Apr. 1975 82 p refs Transl. into ENGLISH from the book "Metodika Geofizicheskikh Issledovaniy Okeanov" Moscow, 1974 66 p
(JPRS-64644) Avail: NTIS HC $4.75

Methods used to study the sedimentary stratum at sea and to determine the changes of the force of gravity at sea are reviewed. For individual titles, see N75-23067 through N75-23071.

N75-23067 Joint Publications Research Service, Arlington, Va.
SEISMIC INVESTIGATIONS OF THE SEDIMENTARY STRATUM AT SEA, USING THE REFLECTED WAVE METHOD
A. A. Gagelgants, A. M. Gribanov, L. I. Kogan, Ya. P. Malovitskiy, L. R. Merklin, Yu. M. Mistryukov, and G. B. Udintsev *In its* Geophys. Methods for Studying the Ocean 28 Apr. 1975 p 1-29 refs Transl. into ENGLISH from the book "Metodika Geofizicheskikh Issledovaniy Okeanov" Moscow, 1974 p 27-48 (For availability see N75-23066 14-48)

The sedimentary stratum in the earth's crust was studied by seismic surveying, utilizing the reflected wave method and the wave field created by these waves. Emphasis is placed on marine seismic surveying of the sedimentary stratum under sea and ocean bottoms. Results are presented. Author

N75-23068 Joint Publications Research Service, Arlington, Va.
DETERMINING THE SPEED OF SOUND IN SEDIMENTS DURING SEISMIC PROFILING
B. Ya. Karp, Ye. A. Mouravova, A. M. Sagalevich, and B. V. Shekhvalov *In its* Geophys. Methods for Studying the Ocean 28 Apr. 1975 p 30-34 refs Transl. into ENGLISH from the book "Metodika Geofizicheskikh Issledovaniy Okeanov" Moscow, 1974 p 77-81 (For availability see N75-23066 14-48)

Continuous seismic profiling systems containing transceiving seismic buoys to determine the speed of sound in the sedimentary layer are discussed. In this method, hodographs of subbottom reflections are obtained directly and used to compute the speed of sound in sedimentary rocks. The feasibility of introducing this method on Soviet ships engaged in seismic investigations of the ocean bottom is demonstrated. Author

N75-23069 Joint Publications Research Service, Arlington, Va.
GEOACOUSTIC PROFILING WHILE STUDYING THE SEDIMENTARY STRATUM'S STRUCTURE
L. I. Lebedev, V. I. Gelman, and V. I. Paduchikh *In its* Geophys. Methods for Studying the Ocean 28 Apr. 1975 p 35-42 Transl. into ENGLISH from the book "Metodika Geofizicheskikh Issledovaniy Okeanov" Moscow, 1974 p 82-89 (For availability see N75-23066 14-48)

Geoacoustic profiling based on the excitation of elastic vibrations in the water layer with electrospark discharge is described and compared to seismic surveying which utilizes explosions as the vibration generation method in the study of the ocean bottom's structure. Various methods of recording vibrations are discussed; with emphasis on the varible density method on electrochemical paper. It is shown that geoacoustic profiling is an effective method for studying the ocean bottom's geological structure and searching for oil and gas-bearing structures on the ocean bottom. J.M.S.

N75-23070 Joint Publications Research Service, Arlington, Va.
MARINE GRAVIMETRIC OBSERVATIONS
V. A. Tulin *In its* Geophys. Methods for Studying the Ocean 28 Apr. 1975 p 43-59 refs Transl. into ENGLISH from the book "Metodika Geofizicheskikh Issledovaniy Okeanov" Moscow, 1974 p 90-102 (For availability see N75-23066 14-48)

Automation of marine gravimetric observations is discussed. A gravimeter consisting of a sensor and an analog-to-digital readout converter based on the time-pulse coding method is described along with the processing of the signals on a digital

computer. The performance of the gravimeter was investigated in the laboratory and on the sea, on submarines and surface ships. Results are discussed. J.M.S.

N75-23071 Joint Publications Research Service, Arlington, Va.
INTERPRETING MARINE GRAVIMETRIC OBSERVATIONS
A. G. Gaynonov *In its* Geophys. Methods for Studying the Ocean 28 Apr. 1975 p 60-80 refs Transl. into ENGLISH from the book "Metodika Geofizicheskikh Issledovaniy Okeanov" Moscow, 1974 p 103-120 (For availability see N75-23066 14-48)

Various methods used to interpret marine gravimetric observations are discussed. It is indicated that automation of the reduction operations and the interpretation of gravity anomalies is required due to the use of shipborne gravimeters featuring continuous registration of changes in the force of gravity. The Bouger reduction with allowances for bottom topography is preferred when studying the deep structure of ocean bottoms and deriving the quantitative characteristics of anomalous masses. Methods of evaluating the parameters of anomaly-forming bodies by determining the depths of specific points in the anomalous masses and the statistical characteristics of the gravitational fields are recommended. Author

N75-23072*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
WAVE CLIMATE MODEL OF THE MID-ATLANTIC SHELF AND SHORELINE (VIRGINIAN SEA): MODEL DEVELOPMENT, SHELF GEOMORPHOLOGY, AND PRELIMINARY RESULTS
Victor Goldsmith (Virginia Inst. of Marine Sci.), W. Douglas Morris, Robert J. Byrne (Virginia Inst. of Marine Sci.), and Charles H. Whitlock Washington 1974 153 p refs
(NASA-SP-358; VIMS-SRAMSOE-38) Avail: NTIS HC $6.25 CSCL 08C

A computerized wave climate model is developed that applies linear wave theory and shelf depth information to predict wave behavior as they pass over the continental shelf as well as the resulting wave energy distributions along the coastline. Reviewed are also the geomorphology of the Mid-Atlantic Continental Shelf, wave computations resulting from 122 wave input conditions, and a preliminary analysis of these data. G.G.

N75-23073# Delft Hydraulics Lab. (Netherlands). De Voorst Lab.
OFFSHORE SEDIMENT TRANSPORT AND EQUILIBRIUM BEACH PROFILES Ph.D. Thesis - Delft Univ. of Technol.
D. H. Swart Dec. 1974 318 p refs Sponsored by Dutch Min. of Public Works
(Publ-131) Avail: NTIS HC $9.25

A predictive model, based on both model data and prototype data, was developed to allow computation of the offshore sediment transport on sandy beaches under wave action and of the corresponding time dependent and eventual equilibrium beach profiles. The general profile schematization is discussed, and assumptions for the D-profile are elaborated. Apparatus, data, and analyzing techniques are dealt with, and the results and analysis of the data are presented. ESRO

N75-23074# Delft Hydraulics Lab. (Netherlands).
EQUILIBRIUM PROFILES OF COARSE MATERIAL UNDER WAVE ATTACK
E. VanHijum Sep. 1974 21 p refs Presented at the 14th Intern. Conf. on Coastal Eng., Copenhagen, 24-28 Jun. 1974
(Publ-133) Avail: NTIS HC $3.25

In order to obtain design criteria for artificial gravel beaches, a research program was drawn up to study the behavior of gravel beaches under wave attack. The dimensions, form, and manner of formation of an equilibrium profile under regular, perpendicular wave attack were determined. It was found that gravel with a D90 smaller than 0.006 m is sensitive to scale effects. ESRO

N75-23075# Defence Research Establishment Pacific, Victoria (British Columbia).
THE INTERACTION OF WIND WAVES AND INTERNAL WAVES: EXPERIMENTAL MEASUREMENTS
B. Hughes and H. L. Grant Aug. 1974 112 p refs
(AD-A007063; DREP-74-1) Avail: NTIS CSCL 08/3

Internal waves were generated by a ship using the dead water effect in areas where the water contains a strong near-surface density gradient. The effects of these internal waves on the wind waves were examined. The principal measurements included height and slope statistics of the wind waves and horizontal currents in the internal waves. The effects on the wind waves were always observable from an aircraft; however, in measurements made only along the ship's track, the effects of the internal waves were not always readily distinguishable from other factors that influence the wind wave field. By using statistical techniques, relationships have been established between the wind waves, internal waves and the wind velocity. The principal finding is that the wind wave field is relatively more sensitive to internal wave currents at low wind speeds than in high winds. Numerical values are given. GRA

N75-23076# Naval Undersea Center, San Diego, Calif.
HYDRODYNAMIC ASPECTS OF FLOATING STABLE OCEAN PLATFORMS Research and Development Report, 1968-1973
Evan R. Johnson Nov. 1974 94 p refs
(AD-A006570; NVC-TP-427) Avail: NTIS CSCL 13/10

This report details a Naval Undersea Center five-year study on the hydrodynamics of floating stable ocean platforms constructed from repetitively cast concrete modules. The effort centered on analytical prediction and measurement through model testing of the following design aspects for several platform configurations: (1) platform heave, pitch, roll, yaw, surge and sway motion due to wave action; (2) horizontal drag forces in various sea states; (3) structural forces on modules due to wave action; and (4) underwater submersible docking in a module. GRA

N75-23077# Woods Hole Oceanographic Institution, Mass.
KNORR 34, 13 OCTOBER - 8 NOVEMBER AND KNORR 36, 6-22 DECEMBER 1973
Donald A. Moller Dec. 1974 80 p Prepared in cooperation with Applied Physics Lab., Johns Hopkins Univ.
(Contract N00014-66-C-0241; NR Proj. 083-004)
(AD-A006605; WHOI-74-94) Avail: NTIS CSCL 03/3

KNORR 34, a cruise of the Woods Hole Oceanographic Institution's Buoy Project, serviced deep-sea moorings from 13 October to 8 November, 1973. Three stations were recovered and four set at Site D (39 deg. 10 min. N., 70 deg. 00 min. W.). The Internal Wave Experiment (IWEX) was initiated. The Tri-moor and a spar buoy were set at 27 deg. 45 min. N., 69 deg. 50 min. W., and five auxiliary moorings for navigation purposes were set and recovered. Twenty-five CTD stations were made in the vicinity of moorings and for geostrophic flow measurements. GRA

N75-23078# Defence Research Establishment Ottawa (Ontario).
NEAR-SURFACE CURRENT IN ROBESON CHANNEL
R. K. Chow Jan. 1975 69 p refs
(AD-A006576; DREO-R-709) Avail: NTIS CSCL 08/3

In the report, near-surface current data in Robeson Channel are analyzed and the prominent characteristics of the current are described. Comparison of the current velocity between vertical as well as lateral positions in a cross section of the channel is made. Tidal and non-tidal oscillations in the velocity components are identified and the near-surface average current profile which may be used for mass transport calculation is obtained. GRA

N75-22853 Joint Publications Research Service, Arlington, Va.
RADAR MEASUREMENT OF THE SEAWAVE PARAMETERS
Ye. O. Zhilko, A. A. Zagorodnikov, and I. V. Kireyev *In its* Meteorol. and Hydrology, No. 2, 1975 (JPRS-64670) 1 May 1975 p 145-151 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 12, 1975 p 113-117 (For availability see N75-22834 14-42)

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N75-23079*# Scientific Translation Service, Santa Barbara, Calif.
ALIMENTARY ORIGIN OF NYCOTHEMERAL VARIATIONS IN THE ELECTRICAL ACTIVITY OF THE SMALL INTESTINE IN THE RAT
M. Ruckebusch and J. P. Ferre Washington NASA May 1975 9 p refs Transl. into ENGLISH from Comp. Rend. Soc. Biol. (Masson), v. 167, no. 12, 1973 p 2005-2009
(Contract NASw-2483)
(NASA-TT-F-16282) Avail: NTIS HC $3.25 CSCL 06C

Tests were performed on the alimentary origin of nycothemeral variations in the electrical activity of the jejenum in rats accustomed to an intermittent fast of 3 days per week. The roll of gastric fullness seems to be critical in the presence of segmental activity in the rat. Author

N75-23080# Joint Publications Research Service, Arlington, Va.
VESTNIK OF THE USSR ACADEMY OF MEDICAL SCIENCES, NO. 3, 1975
N. N. Blokhin 1975 154 p refs Transl. into ENGLISH from Vestn. Akad. Med. Nauk SSSR (USSR), no. 3, 1975 p 16-37 (JPRS-64795) Avail: NTIS HC $6.25

Research on superhigh frequency effects on animal metabolism and trace elements of copper, manganese, molybdenum, and nickel. Methods to increase human radiation tolerance are investigated, using chemical agents primarily. For individual titles, see N75-23081 through N75-23083.

N75-23081 Joint Publications Research Service, Arlington, Va.
EFFECTS OF SUPERHIGH FREQUENCY FIELDS OF DIFFERENT INTENSITY ON THE BALANCE AND METABOLISM OF COPPER, MANGANESE, MOLYBDENUM AND NICKEL IN THE ORGANISM OF EXPERIMENTAL ANIMALS
R. D. Gabovich, A. A. Minkh, and I. A. Mikhalyuk *In its* Vestnik of the USSR Acad. of Med. Sci., No. 3, 1975 (JPRS-64795) 1975 p 19-27 refs Transl. into ENGLISH from Vestn. Akad. Med. Nauk SSSR (USSR), no. 3, 1975 p 16-22 (For availability see N75-23080 14-51)

Biological effects of electromagnetic fields are discussed. Changes in metabolic balance due to the synergistic actions of copper, manganese, molybdenum, and nickel exposed to superhigh frequencies are reviewed. Trace element content in feces and urine in rats is shown, along with trace element content in specific rat tissues and organs plotted against superhigh frequency intensity. J.A.M.

N75-23082 Joint Publications Research Service, Arlington, Va.
THE MECHANISM OF ADAPTOGENIC EFFECT OF ULTRAVIOLET RADIATION
A. P. Zabaluyeva, Yu. I. Prokopenko, and N. M. Dantsig *In its* Vestnik of the USSR Acad. of Med. Sci., No. 3, 1975 (JPRS-64795) 1975 p 28-32 refs Transl. into ENGLISH from Vestn. Akad. Med. Nauk SSSR (USSR), no. 3, 1975 p 23-26 (For availability see N75-23080 14-51)

Methods are discussed whereby an organism's adaptation ability to radiation pollution of the environment can be increased. Activity variations of succinic dehydrogenase (SDH) and alpha-glycerophosphate dehydrogenase (alpha-GPD) in different groups of animals are presented. SDH/alpha-GPD ratio is correlated with hexenal sleep duration. Tumor size and immunity indices are plotted against ultraviolet radiation dosage. A suberythema dose of ultraviolet radiation was found to increase the activity of the protection systems of the organism. J.A.M.

N75-23083 Joint Publications Research Service, Arlington, Va.
EFFECT OF ULTRAVIOLET RADIATION ON TOLERANCE OF THE ORGANISM TO CHEMICAL SUBSTANCES
R. D. Gabovich, A. A. Minkh, and I. N. Motuzkov *In its* Vestnik of the USSR Acad. of Med. Sci., No. 3, 1975 (JPRS-64795) 1975 p 33-46 refs Transl. into ENGLISH from Vestn. Akad. Med. Nauk SSSR (USSR), no. 3, 1975 p 26-37 (For availability see N75-23080 14-51)

White rats were irradiated daily with ultraviolet radiation for 3 weeks prior to administering chemicals. These chemical agents were used to study the organism at different levels of radiation (defficient, normal, excessive). Biochemical, physiological, and immunological indices of animals are presented as related to the supply of UV radiation. The coproporphyrin content of urine after lead administration is discussed, along with coefficients of bromosulfalein retention. Catechol amine levels in adrenals and myocardium; indices of animals exposed to a combination of methyl mercaptophos, UV, and overheating for 3 months; and benzene and carbon tetrachloride metabolite levels in urine are considered. Copper and lead levels in animal tissues are also reviewed. J.A.M.

N75-23084# Advisory Group for Aerospace Research and Development, Paris (France).
MEDICAL REQUIREMENTS AND EXAMINATION PROCEDURES IN RELATION TO THE TASKS OF TODAY'S AIRCREW: EVALUATION OF THE SPECIAL SENSES FOR FLYING DUTIES
G. Perdriel, ed. Feb. 1975 94 p refs In ENGLISH; partly in FRENCH Presented at Aerospace Med. Panel Meeting, Naples, 16-20 Sep. 1974
(AGARD-CP-152) Avail: NTIS HC $4.75

Medical requirements and examination procedures in relation to sensory tasks of aircrews are reported. For individual titles, see N75-23085 through N75-23097.

N75-23085 Advisory Group for Aerospace Research and Development, Paris (France).
MEDICAL REQUIREMENTS AND EXAMINATION PROCEDURES IN RELATION TO THE TASKS OF TODAY'S AIRCREW: INTRODUCTORY REMARKS c52
Aristice Scano *In its* Med. Requirements and Exam. Procedures in Relation to the Tasks of Today's Aircrew Feb. 1975 3 p refs (For availability see N75-23084 14-51)

The medical and aptitudinal selection of aircrew and periodical examinations of their physiopsychological efficiency are necessary to define better fitness in relation to perceptive capacities, to standards for visual and hearing devices, and to intelligibility of speech transmitted to the aircrew in flight. G.G.

N75-23086 Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
EVALUATION OF ROLL AXIS TRACKING AS AN INDICATOR OF VESTIBULAR/SOMATO SENSORY FUNCTION c52
A. M. Junker and C. R. Replogle *In* AGARD Med. Requirements and Exam. Procedures in Relation to the Tasks of Today's Aircrew Feb. 1975 8 p refs (For availability see N75-23084 14-51)

To learn more about the effects of vestibular/somato sensory information upon visual motor control, a roll axis tracking simulator was developed. A description of this simulator, including the ability to run with and without motion cues, is given. Large amplitude roll angle motion cues were used. The effects of various plant dynamics, relating to plant complexity on tracking performance, are discussed. For a particular set of plant dynamics requiring a considerable amount of lead compensation, it is shown that subjects perform significantly better with the presence of motion cues. It has been suggested that primarily vestibular system contributions allow motion cues to aid pilot performance.
Author

N75-23087 Institute of Aviation Medicine, Fuerstenfeldbruck (West Germany).
THE EFFECTS OF PURE TONE HEARING LOSSES ON AVIATORS' SENTENCE INTELLIGIBILITY IN QUIET AND IN AIRCRAFT NOISE c52
G. R. Froelich *In* AGARD Med. Requirements and Exam. Procedures in Relation to the Tasks of Today's Aircrew Feb. 1975 4 p (For availability see N75-23084 14-51)

Pure tone audiometry remains the basis for the acceptance of applicants as well as the annual follow-ups of rated pilots. Speech audiometry in quiet is very efficient for the assessment of disability for compensation and the selection of hearing aids, but not for decisions on deafened aircrew. Present audiometric standards for rated aircrew make sure that aviators with hearing losses admitted by standards have no difficulties with inflight voice communication. The decision on the disposal of experienced but deafened aircrew should be based on the discrimination of connected speech in the presence of a background aircraft noise. Author

N75-23088 Naval Aerospace Medical Research Lab., Pensacola, Fla. Acoustical Sciences Div.
ASSESSING AN AVIATOR'S ABILITY TO HEAR SPEECH IN HIS OPERATIONAL ENVIRONMENT c52
Carl E. Williams, James D. Mosko, and James W. Greene *In* AGARD Med. Requirements and Exam. Procedures in Relation to the Tasks of Today's Aircrew Feb. 1975 10 p refs (For availability see N75-23084 14-51)

The use of multiple word test items is analyzed whether it influences the intelligibility function of test words relative to their presentation as single word test items and whether such items provide a sensitive measure of an individual's ability to hear speech in aircraft acoustical environments. High quality tape recordings were constructed of single, double, and triple word test items from six monosyllabic word lists of the Modified Rhyme Test (MRT), a multiple choice intelligibility test. The test words were incorporated in a carrier phrase somewhat analogous to typical aircraft radio messages. The recorded lists were mixed with shaped noise and played back to a group of listeners at three signal-to-noise ratios. At the two best signal-to-noise ratios (+4 db and 0 db), there was little difference in overall listener performance for the single, double, and triple word test items. Author

N75-23089 Army Aeromedical Research Lab., Fort Rucker, Ala.
CHARACTERISTICS OF NEW GENERATION MILITARY NOISE CANCELING MICROPHONES c32
Robert T. Camp, Jr., Ben T. Mozo, and James H. Patterson *In* AGARD Med. Requirements and Exam. Procedures in Relation to the Tasks of Today's Aircrew Feb. 1975 6 p (For availability see N75-23084 14-51)

Military voice communication systems have two undesirable characteristics: (1) they have excessive distortion that causes low intelligibility; and (2) they emit excessive noise which constitutes an acoustic hazard to military personnel. A prototype voice communication system is developed that includes a new generation noise cancelling microphone. Results of a test are presented to show that near field linearity and improved noise cancelling characteristics are the desired characteristics of future noise cancelling microphones. Author

N75-23090 Centre Principal d'Expertises Medicales du Personnel Navigant, Paris (France).
THE ROLE OF VOCAL AUDIOMETRY IN THE SELECTION OF NAVIGATION PERSONNEL [LA PART DE L'AUDIOMETRIE VOCALE DANS LA SELECTION DU PERSONNEL NAVIGANT] c52
P. Blanc and J. D. P. Bastien *In* AGARD Med. Requirements and Exam. Procedures in Relation to the Tasks of Today's Aircrew Feb. 1975 3 p In FRENCH (For availability see N75-23084 14-51)

Different clinical procedures and functions of examining and diagnosing hearing problems of navigation personnel are discussed. Data are given on localization of deafness, physiological surviellance of navigation personnel problems, and standards for normal aerial security. The application of these methods to personnel selection are also examined. Transl. by E.H.W.

N75-23091 Erlangen-Nuremberg Univ. (West Germany). Dept. of Physiology.
OBJECTIVE ELECTROPHYSIOLOGICAL MEASUREMENTS OF EAR CHARACTERISTICS, INTELLIGIBILITY OF VOWELS AND JUDGEMENT OF THE STAGE OF ATTENTION c52
Manfred Spreng *In* AGARD Med. Requirements and Exam. Procedures in Relation to the Tasks of Today's Aircrew Feb. 1975 10 p refs (For availability see N75-23084 14-51)

The influence of short time annoying noise upon evoked human responses can be demonstrated if the noise reaches intensities around 70 db. Ear characteristics measured show objectively the behavior of the individual ear in the range above the increased thresholds. Based upon their course compensating hearing aids can be adapted which do not only amplify in a variable degree but also may show even a range of attenuation with increasing sound pressure levels in some special cases of recruitment. Using computer generated vowels as exactly triggered stimuli evoked responses have been recorded with a 16 to 37% increase compared with speech noise stimulation of equal intensity near threshold. First trials are reported to select the single responses corresponding to the FFT-EEG spectra, thus, overcoming the influence of different stages of attention. By this means new data may be gathered concerning the change of evoked potentials from change of attention doing additional tasks, having multisensory input or succumbing sedation. Author

N75-23092 Italian Air Force Medico-Legal Inst., Milan.
THE IMPORTANCE OF THE DOSAGE OF THIOCYANATES IN URINE AND BLOOD OF FLYING PERSONNEL FOR THE PREVENTION OF DISEASES OF VISUAL FUNCTION c52
G. Durazzini, F. Zazo, and G. Bertoni (Milan Univ.) *In* AGARD Med. Requirements and Exam. Procedures in Relation to the Tasks of Today's Aircrew Feb. 1975 5 p refs (For availability see N75-23084 14-51)

The relationship between the quantity of cyanides introduced into the organism with smoke, the increase of thiocyanides in organic fluids (blood and urine) and any impairment of the multiple and complex functions of the optic nerve was considered. The amount of thiocyanides present was measured in a group of healthy non-smokers and no significant increase of thiocyanides was found, either in the urine or in the blood and for comparative purposes on another group of healthy smokers in whom a clear increase in the average thiocyanide values was found, especially in urine and in proportion to the number of cigarettes smoked, in comparison with non-smokers. Particular tests of central and peripheric visual function showed slight impairments or results at the lower limits of the normal score (particularly in the test of visual acuteness in reduced lighting and in mesopic campimetry) in 50% of the subjects smoking more than 10 cigarettes (average quantity of thiocyantes in urine : 9,3 mg/l). Author

N75-23093 Dunlap and Associates, Inc., la Jolla, Calif.
EVALUATION OF THE SPECIAL SENSES FOR FLYING DUTIES: PERCEPTUAL ABILITIES OF LANDING SIGNAL OFFICERS (LSOS) c52
C. A. Brictson *In* AGARD Med. Requirements and Exam. Procedures in Relation to the Tasks of Today's Aircrew Feb. 1975 8 p refs (For availability see N75-23084 14-51)

The job of the landing signal officer is to provide for the safe and expeditious recovery of aircraft aboard ship. Perceptual abilities related to job performance were identified and used as a basis to select a preliminary battery of perceptual tests which was administered to qualified LSOs and trainees. Results indicate that LSOs may be differentiated on the basis of perceptual style on a field independence dimension. Suggestions for validation of the test battery against LSO performance criteria are presented and reviewed. Author

N75-23094 Naval Aerospace Medical Research Lab., Pensacola, Fla. Aerospace Psychology Dept.
AIR-TO-AIR VISUAL TARGET ACQUISITION c52
James E. Goodson *In* AGARD Med. Requirements and Exam. Procedures in Relation to the Tasks of Today's Aircrew Feb. 1975 9 p refs (For availability see N75-23084 14-51)

A most critical element of tactical advantage in the air combat environment is the early visual acquisition and continued visual tracking of airborne targets. Little data are available which relate specific visual functions or tests to air-to-air performance ability. Initial visual acquisition of airborne targets usually occurs at distances far less than calculated visibility ranges. Further, many targets go undetected even though they pass well within the acquisition range. There appears to be great variability among aviation personnel in visual acquisition performance. However, potential procedures for either selecting or training personnel for this special ability have not been validated against inflight performance criteria. Author

N75-23095 Centro di Studi e Ricerche di Medicina Aeronautica e Spaziale, Rome (Italy).
VISUAL ACUITY OF ASTIGMATIC SUBJECTS AND FITNESS TO AIR FORCE SERVICE c52
Paolo Rota and Carlo Terrana *In* AGARD Med. Requirements and Exam. Procedures in Relation to the Tasks of Today's Aircrew Feb. 1975 3 p refs (For availability see N75-23084 14-51)

Visual acuity in different axes was studied in astigmatic subjects, and its importance is considered, in view of fitness in flight and on ground special tasks. The research was carried out by means of optotypes made with Landolt rings, on purpose redesigned, for distant and near vision. Author

N75-23096 School of Aerospace Medicine, Brooks AFB, Tex. Ophthalmology Branch.
MICROSTRABISMUS IN FLYING PERSONNEL (DIAGNOSIS AND DISPOSITION) c52
Thomas J. Tredici *In* AGARD Med. Requirements and Exam. Procedures in Relation to the Tasks of Today's Aircrew Feb. 1975 10 p refs (For availability see N75-23084 14-51)

It is considered of paramount importance for the aviator to have the ability to accurately perceive depth and judge distances. One of the important elements contributing to his depth perception is stereopsis. The United States Air Force (USAF) depth perception tests are in reality tests of stereopsis. Examiners are aware that a number of trained aviators always have difficulties in passing these stereoscopic tests. In the past those who failed these tests but had straight eyes and normal visual acuity were thought to have idiopathic partial lack of stereoacuity, most likely on a central basis. Recently developed subtle diagnostic motility techniques have revealed that many of these airmen in reality have a small degree of strabismus (crossed eyes). Presently, this condition is known as microstrabismus or microtropia.
Author

N75-23097 Amsterdam Univ. (Netherlands).
LINEAR ACCELERATION PERCEPTION THRESHOLD DETERMINATION WITH THE USE OF A PARALLEL-SWING c52
A. J. Greven, W. J. Oosterveld, and W. J. A. C. Rademakers *In* AGARD Med. Requirements and Exam. Procedures in Relation to the Tasks of Today's Aircrew Feb. 1975 4 p refs (For availability see N75-23084 14-51)

The perception of linear acceleration in humans is discussed. The parallel swing -as a tool to collect data on the functioning of the otolithic system- is described. In twelve human subjects experiments were conducted with the parallel swing in order to determine the threshold of perception for movements of this swing. The effect of different body positions on this threshold was also determined. In another series of experiments the amplitude of the sinusoidal compensatory eye movements was investigated when the swing was oscillating with an amplitude of 12.5 cm, as well as with an amplitude of 25 cm. Author

N75-23098# Oak Ridge National Lab., Tenn.
GEOECOLOGY INFORMATION SYSTEM. PART 1: BIOGEOGRAPHIC MAPPING OF SPECIES RANGES: DOCUMENTATION OF INPUT AND DATA CHECKING PROCEDURE FOR COMPUTER STORAGE AND RETRIEVAL OF INFORMATION
R. K. Schreiber, R. L. Stephenson, F. G. Goff, D. C. West, and G. Muse Dec. 1974 46 p refs Sponsored by ERDA
(EDFB-IBP-74-5-Pt-1) Avail: NTIS HC $3.75

Rationale is presented for the design and development of a regional scale data bank for biogeographical information. Counties are used as the basic cell for storage and retrieval of data. Application of the described procedure for manual digitization and coding of species range maps is made using tree species found in Little's Atlas of United States Trees. The computer program for storage and retrieval of this spatial data is documented.
Author (NSA)

N75-23099# Maryland Univ., College Park. Dept. of Microbiology.
MICROBIAL ECOLOGY AND THE PROBLEM OF PETROLEUM DEGRADATION IN CHESAPEAKE BAY
R. R. Colwell, J. D. Walker, and J. D. Nelson, Jr. 1974 14 p refs
(Contract N00014-69-A-0220-0006; Grant NSF GD-31707) (AD-A006590) Avail: NTIS CSCL 06/13

Petroleum degradation studies are being done to obtain a seasonal incidence, as well as species distribution of petroleum-degrading microorganisms in Chesapeake Bay. From analysis of water and sediments collected at two stations in Chesapeake Bay it was found that the concentration of petroleum in an oil polluted site in Baltimore Harbor was five times greater than in Eastern Bay. The numbers of petroleum-degrading microorganisms, measured by direct and replica plating, in the water and sediment samples were related to the concentration of oil in each sample. Total yields of petroleum-degrading microorganisms grown on an oil substrate were greater for those organisms exposed to oil in the natural environment. Microorganisms isolated from water and sediment samples collected in Baltimore Harbor grew on substrates representative of the aliphatic, aromatic and refractory hydrocarbons. From analyses of species distribution, it was observed that a hydrocarbon-utilizing fungus, Cladosporium resinae, and actinomycetes were predominant among the hydrocarbon-utilizing isolates. GRA

52 AEROSPACE MEDICINE

Includes physiological factors, biological effects of radiation; and weightlessness.

N75-23100 Kansas Univ., Lawrence.
THE EFFECT OF BODY INVERSION ON MIDDLE EAR AIR PRESSURE, ACOUSTIC ADMITTANCE AND AUDITORY THRESHOLD Ph.D. Thesis
Michael Edward Winston 1973 63 p
Avail: Univ. Microfilms Order No. 75-6275

Data are given on efforts made to: (1) investigate the influence of altered middle ear pressure, produced by positional change, on auditory sensitivity and acoustic admittance and, (2) determine if the effects of the middle ear air pressure change can be reduced or eliminated by physiological middle air ventilation. Middle ear air pressure, acoustic admittance and auditory sensitivity at 220 Hz was measured on ten normal adults in an upright and, by means of a special examining table, an inverted position. Results indicated that a change in body position from upright to inverted produced a significant increase in middle ear air pressure that could be totally resolved by ventilation of the middle ear. Acoustic admittance based on ambient pressure values was reduced by more than half in the inverted position while admittance values based on maximum amplitude values were not significantly affected by the inversion. Ambient admittance values improved after middle ear ventilation.
Dissert. Abstr.

N75-23101 Wisconsin Univ., Madison.
EFFECTS OF HYPOXIA WITH AND WITHOUT HYPERVENTILATION ON THE CONTROL OF VENTILATION Ph.D. Thesis
Michael Thomas Sharratt 1974 290 p
Avail: Univ. Microfilms Order No. 74-28827

Sustained hyperventilation for periods of two or more hours results in ventilatory responses to imposed CO_2 which is substantially greater than before the period of hyperventilation. However, the magnitude of the changes which occur in ventilatory control is not coordinate with the severity of the hyperventilation. It was the principal hypothesis that the addition of arterial hypoxemia would partially overcome the cerebral vasoconstriction which accompanies hyperventilation. Unanesthetized dogs were intubated and trained to lie in the right lateral decubitus position for periods of up to eight hours. Ventilatory data were recorded on magnetic tape and processed using LINC computers. It appears, relative to man, that resting dogs are mildly hypoxemic and chronically tend to hyperventilate. The mild arterial hypoxemia appears to be due to right to left shunting rather than due to an hypoxic ambient environment, global hypoventilation or impaired diffusion capacity of the lung.
Dissert. Abstr.

N75-23102 Columbia Univ., New York.
DYNAMIC RESPONSE OF A FUEL-FILLED SPHEROIDAL SHELL; AN IMPROVED MODEL FOR STUDYING HEAD INJURY Ph.D. Thesis
Osama M. Y. Talhouni 1974 53 p
Avail: Univ. Microfilms Order No. 75-7539

The human head is modelled by considering the skull to be an elastic prolate spheroidal shell enclosing an acoustic medium which represents the brain. A suddenly applied, uniformly distributed, pressure is applied to the shell surface. Time histories of the distribution of stress in the shell and pressure in the fluid are obtained for material and geometrical parameters representative of a human head. It is found that there is a significant difference in the results obtained using this model from those obtained when the assumption of zero eccentricity,

i.e., spherical geometry, is made, but not in the important maximum negative pressure developed in the fluid. Dissert. Abstr.

N75-23103 Albany Medical Coll., N.Y.
THE EFFECTS OF SYSTEMIC HYPOXEMIA ON THE PARTITION OF PULMONARY BLOOD FLOW DURING UNILATERAL HYPOXIC VENTILATION Ph.D. Thesis
Michael Gordon Levitzky 1974 113 p
Avail: Univ. Microfilms Order No. 75-7079

The effects of inducing systemic arterial hypoxemia on the partition of blood flow between both lungs during unilateral hypoxic ventilation of one lung were studied on dogs. When both lungs were ventilated with 100% O2 the left lung received about 42% of the cardiac output. In contrast, when the left lung was ventilated with 6% O2 while the right lung was maintained with 100% O2, blood flow to the left lung decreased to about 24% of the cardiac output. This decrease in flow was associated with the appearance of a large retrograde flow component in the phasic flow trace. Substitution of room air for the 100% O2 inspired by the normoxic right lung significantly decreased arterial PO2, and increased flow through the hypoxic left lung to near control levels. Dissert. Abstr.

N75-23104 Clemson Univ., S.C.
A HEART RATE MONITORING SYSTEM UTILIZING ADVANCED MICROELECTRONIC CONCEPTS Ph.D. Thesis
John Michael Murray 1974 257 p
Avail: Univ. Microfilms Order No. 75-11506

A prototype system capable of monitoring and storing heart rate information for 24-hour periods was designed, constructed, and tested. LSI register memories were used for data storage and small and medium scale CMOS integrated circuits formed the control logic. Micropower operational amplifiers performed the analog signal processing functions. The monitor was used to obtain data from six subjects selected from the University community. Each subject wore the heart rate monitor for a period of 24 hours and each provided a written log of his daily activities. Treadmill testing provided an additional source of information. Data obtained from the monitoring system was transferred to and analyzed by a digital computer. The computer analysis programs provided two primary results: a plot of heart rate as a function of time, and a statistical analysis of the data over any specified time interval. Dissert. Abstr.

N75-23105 Houston Univ., Tex.
FATIGUE IN SELECTED LOWER LIMB MUSCLE GROUPS WHILE WALKING IN A FULL PRESSURE SUIT Ph.D. Thesis
John W. Dyck, Jr. 1974 88 p
Avail: Univ. Microfilms Order No. 75-10586

The technique of frequency analysis was used to interpret EMG signals generated in an operational situation which involved isotonic exercise to develop baseline indexes of local muscle fatigue and to fill descriptive gaps about changes in the EMG signal as selected muscle groups were exercised to develop fatigue. The purpose of the full pressure suit was to load the selected muscle groups and to provide muscle fatigue data from loaded muscles for comparisons with muscle fatigue data from unloaded muscles. Results of the non-parametric statistical analyses and graphic comparisons showed the individual activity of the muscle groups and the interdependent relationships between the effect of walking speed and suited or unsuited conditions on each muscle group. These relationships were interpreted from the patterns of EMG percentages in the time series samples taken at five minute intervals during each 15-minute exercise trial. Dissert. Abstr.

N75-23106*# Kanner (Leo) Associates, Redwood City, Calif.
WEIGHTLESSNESS, MEDICAL AND BIOLOGICAL RESEARCH
V. V. Parin, ed., O. G. Gazenko, ed., Ye. M. Yuganov, ed., P. V. Vasilyev, ed., and I. I. Kasyan, ed. Washington NASA Mar. 1975 543 p refs Transl. into ENGLISH of the book "Nevesemost: Mediko-biologicheskiye Issledovaniye" Moscow, Meditsina Press, 1974 455 p
(Contract NASw-2481)
(NASA-TT-F-16105) Avail: NTIS HC $12.50 CSCL 06S

Physiologikal aspects of manned space flight are discussed with emphasis on weightlessness as the primary unfavorable factor. For individual titles, see N75-23107 through N75-23133.

N75-23107* Kanner (Leo) Associates, Redwood City, Calif.
PHYSIOLOGICAL PROBLEMS OF WEIGHTLESSNESS
P. V. Vasilyev and I. I. Kasyan *In its* Weightlessness: Med. and Biol. Res. (NASA-TT-F-16105) Mar. 1975 p 1-15 Transl. into ENGLISH from the book "Nevesemost: Mediko-Biologicheskiye Issledovaniye" Moscow, Meditsina Press, 1974 p 7-18 (For availability see N75-23106 14-52)
CSCL 06S

A brief review of the compensatory-adjusting body changes observed during and after human exposure to prolonged spaceflight is given. Pathological disturbances caused by increased functional hypokinesia and weightlessness loads affect the cardiovascular system, the nervous and hormonal systems, and the state of the skeletal musculo apparatus. G.G.

N75-23108* Kanner (Leo) Associates, Redwood City, Calif.
REACTIONS OF ASTRONAUTS UNDER WEIGHTLESS CONDITIONS
I. I. Kasyan, V. I. Kopanev, and V. I. Yazdovskiy *In its* Weightlessness: Med. and Biol. Res. (NASA-TT-F-16105) Mar. 1975 p 15-32 Transl. into ENGLISH from the book "Nevesemost: Mediko-Biologicheskiye Issledovaniye" Moscow, Meditsina Press, 1974 p 19-33 (For availability see N75-23106 14-52)
CSCL 06S

Experimental data show that weightlessness conditions lasting 5 days or more (18-25) do not produce significant disturbances in physical reactions of astronauts, with the exception of some singularities in functioning of the cardiovascular system: A reduction in heart rate and somewhat large fluctuations in the physiological indicators of cutaneogalvanic reactions. Author

N75-23109* Kanner (Leo) Associates, Redwood City, Calif.
PHYSIOLOGICAL MECHANISMS OF THE EFFECT OF WEIGHTLESSNESS ON THE BODY
I. I. Kasyan and V. I. Kopanev *In its* Weightlessness: Med. and Biol. Res. (NASA-TT-F-16105) Mar. 1975 p 32-40 Transl. into ENGLISH from the book "Nevesemost: Mediko-Biologicheskiye Issledovaniye" Moscow, Meditsina Press, 1974 p 34-40 (For availability see N75-23106 14-52)
CSCL 06S

Experimental data show that physiological reactions observed under weightlessness conditions are caused by: (1) The direct effect of weightlessness, as a consequence of decrease ("disappearance") of the weight of body tissues and organs; and (2) the mediated effect of weightlessness, as a result of changes in the functional state of the central nervous system and the cooperative work of the analyzers. The human body adopts to weightless conditions under the prolonged effects of it. In this case, four periods can be distinguished: The first period, a transitional process lasting from 1 to 24 hours; second period, initial adaptation to conditions of weightlessness and readjustment of all functional systems of the body; the third period, adaptation to the unusual mechanical conditions of the external environment, lasting from 3 to 8 days and more; and the fourth period, the stage of possible imbalance of the functions and the systems of some astronauts, as a result of the prolonged effect of weightlessness. Author

N75-23110* Kanner (Leo) Associates, Redwood City, Calif.
REACTIONS OF ANIMALS AND PEOPLE UNDER CONDITIONS OF BRIEF WEIGHTLESSNESS
L. A. Kitayev-Smik *In its* Weightlessness: Med. and Biol. Res. (NASA-TT-F-16105) Mar. 1975 p 41-71 Transl. into ENGLISH from the book "Nevesemost: Mediko-Biologicheskiye Issledovaniye" Moscow, Meditsina Press, 1974 p 41-66 (For availability see N75-23106 14-52)
CSCL 06S

It has been shown that under brief weightlessness sensory reactions arise in a number of people, mainly those under these conditions for the first time, in the form of spatial and visual illusions, motor excitation, in which tonic and motor components can be distinguished, and vestibular-vegetative disturbances (nausea, vomiting, etc.). In repeated flights with creation of

weightlessness, a decrease in the extent of expression and, then, disappearance of these reactions occurred in a significant majority of those studied. Experiments in weightlessness with the vision cut off and with the absence of vestibular functions in the subjects confirm the hypothesis that spatial conceptions of people in weightlessness depend on predominance of gravireceptor or visual afferent signals under these conditions. Author

N75-23111* Kanner (Leo) Associates, Redwood City, Calif.
PERCEPTION OF TIME UNDER CONDITIONS OF BRIEF WEIGHTLESSNESS
V. I. Lebedev, I. F. Chekidra, and I. A. Kolosov *In its* Weightlessness: Med. and Biol. Res. (NASA-TT-F-16105) Mar. 1975 p 71-76 Transl. into ENGLISH from the book "Nevesemost: Mediko-Biologicheskiye Issledovaniye" Moscow, Meditsina Press, 1974 p 67-70 (For availability see N75-23106 14-52)
CSCL 05E

Results of experiments under conditions of brief weightlessness confirmed the theoretical concepts of the dependence of time perception on the emotional state of a man. The time test, together with other methods, can be used to precisely define the emotional state of subjects in stress situations. Author

N75-23112* Kanner (Leo) Associates, Redwood City, Calif.
STATIC-KINETIC REACTIONS OF MAN UNDER CONDITIONS OF BRIEF WEIGHTLESSNESS
I. A. Kolosov *In its* Weightlessness: Med. and Biol. Res. (NASA-TT-F-16105) Mar. 1975 p 76-81 Transl. into ENGLISH from the book "Nevesemost: Mediko-Biologicheskiye Issledovaniye" Moscow, Meditsina Press, 1974 p 71-75 (For availability see N75-23106 14-52)
CSCL 06S

Physical characteristics of human responses to weightlessness simulation during parabolic flights establish body immobilization and visual illusions as the most manifest causes of sensory distrubances. Repeated brief weightlessness exposures gradually decreased expressions of static-kinetic disorders. G.G.

N75-23113* Kanner (Leo) Associates, Redwood City, Calif.
SPACE FORM OF MOTIONSICKNESS
G. L. Komendantov and V. I. Kopanev *In its* Weightlessness: Med. and Biol. Res. (NASA-TT-F-16105) Mar. 1975 p 82-91 Transl. into ENGLISH from the book "Nevesemost: Mediko-Biologicheskiye Issledovaniye" Moscow, Meditsina Press, 1974 p 76-83 (For availability see N75-23106 14-52)
CSCL 06S

Spacesickness under weightlessness conditions is explained mainly by disruption of the activity of the functional system perceiving space and participating in carrying out the balancing function, consisting, in particular, of the vestibular, proprioceptive, interoceptive, visual and cutaneomechanical analyzers. It can be assumed that, under specific conditions, Coriolis acceleration also is a cause of spacesickness. Adaptation is possible by formation of a new functional system which is adequate to the new mechanical conditions of weightlessness. Selection, training, creation of optimum conditions in the spacecraft cabin, medicinal, and technical improvement of spacecraft play an important role in prophylaxis of the space form of seasickness. Author

N75-23114* Kanner (Leo) Associates, Redwood City, Calif.
VESTIBULAR REACTIONS OF ASTRONAUTS DURING FLIGHT IN VOSKHOD SPACECRAFT
Ye. M. Yuganov, A. I. Gorshkov, I. I. Kasyan, I. I. Bryanov, I. A. Kolosov, V. I. Kopanev, F. A. Solodovnik, V. I. Lebedev, and N. I. Popov *In its* Weightlessness: Med. and Biol. Res. (NASA-TT-F-16105) Mar. 1975 p 91-98 Transl. into ENGLISH from the book "Nevesemost: Mediko-Biologicheskiye Issledovaniye" Moscow, Meditsina Press, 1974 p 84-88 (For availability see N75-23106 14-52)
CSCL 06S

It is shown that differing human vestibular resistances to weightlessness stress are connected with the nonuniform initial sensitivity of the vestibular apparatus, as well as with different lengths of vestibular training. However, intensive vestibular training of persons with a moderate degree of sensitivity of the vestibular analyzer does not ensure vestibular stability under weightlessness conditions. G.G.

N75-23115* Kanner (Leo) Associates, Redwood City, Calif.
BLOOD CIRCULATION UNDER WEIGHTLESS CONDITIONS
I. I. Kasyan, V. I. Kopanev, and V. I. Yazdovskiy *In its* Weightlessness: Med. and Biol. Res. (NASA-TT-F-16105) Mar. 1975 p 99-116 Transl. into ENGLISH from the book "Nevesemost: Mediko-Biologicheskiye Issledovaniye" Moscow, Meditsina Press, 1974 p 89-105 (For availability see N75-23106 14-52)
CSCL 06S

Biomedical data obtained on men and animals during weightlessness conditions establish instabilities in pulse rate and blood circulation that smooth out in proportion to adaptation to the weightless condition. The unusual slowness of recovery of pulse rate to initial values after space flight stress is attributed to biological simulation of hormonal shifts and discharge of humoral substances into the blood that prevent a rapid recovery of some biological indicators to initial values. G.G.

N75-23116* Kanner (Leo) Associates, Redwood City, Calif.
SOME RESULTS OF MEDICAL STUDIES OF VOSKHOD 2 SPACECRAFT CREW MEMBERS
I. I. Kasyan, D. G. Maksimov, I. G. Popov, D. G. Terentyev, and L. S. Khachaturyants *In its* Weightlessness: Med. and Biol. Res. (NASA-TT-F-16105) Mar. 1975 p 116-128 Transl. into ENGLISH from the book "Nevesemost: Mediko-Biologicheskiye Issledovaniye" Moscow, Meditsina Press, 1974 p 106-116 (For availability see N75-23106 14-52)
CSCL 06S

Clinical and psychological examinations of the astronauts before, during and after space flight established fluctuations in heart rate, blood circulation, metabolism and sensorimotor reactions that disappeared completely one month after flight. G.G.

N75-23117* Kanner (Leo) Associates, Redwood City, Calif.
BASIC RESULTS OF MEDICAL EXAMINATIONS OF SOYUZ SPACECRAFT CREW MEMBERS
N. N. Gurovskiy, A. D. Yegorov, L. I. Kakurin, and Yu. G. Nefedov *In its* Weightlessness: Med. and Biol. Res. (NASA-TT-F-16105) Mar. 1975 p 128-147 Transl. into ENGLISH from the book "Nevesemost: Mediko-Biologicheskiye Issledovaniye" Moscow, Meditsina Press, 1974 p 117-132 (For availability see N75-23106 14-52)
CSCL 06S

Weightlessness, hypokinesia and intense activity of crew members caused changes in human physiological functions during prolonged space flight as expressed in unusual diurnal rhythms. Microclimate, radiation and the nervous emotional state were not of significance in emergence of human body response reactions. G.G.

N75-23118* Kanner (Leo) Associates, Redwood City, Calif.
CONDITION OF CARDIOVASCULAR SYSTEMS OF ASTRONAUTS DURING FLIGHT OF SOYUZ ORBITAL STATION
V. A. Degtyarev, I. I. Popov, T. V. Batenchuk-Tusko, N. D. Kolmykova, N. A. Lapshina, Z. A. Kirillova, V. G. Doroshev, and Yu. A. Kukushkin *In its* Weightlessness: Med. and Biol. Res. (NASA-TT-F-16105) Mar. 1975 p 147-173 Transl. into ENGLISH from the book "Nevesemost: Mediko-Biologicheskiye Issledovaniye" Moscow, Meditsina Press, 1974 p 133-157 (For availability see N75-23106 14-52)
CSCL 06S

Extensive studies of blood circulation functions during manned space flight demonstrated a pronounced tendency toward an increase in minute volume of the blood and a decrease in pulse wave propagation rate. Individual blood circulation indices had large amplitude fluctuations. Physical work loads caused slow recovery of heart rate, arterial pressure and minute blood volume. G.G.

N75-23119* Kanner (Leo) Associates, Redwood City, Calif.
RESPIRATION, RESPIRATORY METABOLISM AND ENERGY CONSUMPTION UNDER WEIGHTLESS CONDITIONS
I. I. Kasyan and G. F. Makarov *In its* Weightlessness: Med. and Biol. Res. (NASA-TT-F-16105) Mar. 1975 p 174-195

Transl. into ENGLISH from the book "Nevesemost: Mediko-Biologicheskiye Issledovaniye" .Moscow, Meditsina Press, 1974 p 158-175 (For availability see N75-23106 14-52)
CSCL 06S

Changes in the physiological indices of respiration, respiratory metabolism and energy consumption in spacecrews under weightlessness conditions manifest themselves in increased metabolic rates, higher pulmonary ventilation volume, oxygen consumption and carbon dioxide elimination, energy consumption levels in proportion to reduction in neuroemotional and psychic stress, adaptation to weightlessness and work-rest cycles, and finally in a relative stabilization of metabolic processes due to hemodynamic shifts. G.G.

N75-23120* Kanner (Leo) Associates, Redwood City, Calif.
UREA, SUGAR, NONESTERIFIED FATTY ACID AND CHOLESTEROL CONTENT OF THE BLOOD IN PROLONGED WEIGHTLESSNESS
I. S. Balakhovskiy and T. A. Orlova *In its* Weightlessness: Med. and Biol. Res. (NASA-TT-F-16105) Mar. 1975 p 196-207 Transl. into ENGLISH from the book "Nevesemost: Mediko-Biologicheskiye Issledovaniye" Moscow, Meditsina Press, 1974 p 176-187 (For availability see N75-23106 14-52)
CSCL 06S

Biochemical blood composition studies on astronauts during weightlessness flight simulation tests and during actual space flights showed some disturbances of metabolic processes. Increases in blood sugar, fatty acid and cholesterol, and urea content are noted. G.G.

N75-23121* Kanner (Leo) Associates, Redwood City, Calif.
EFFECT OF WEIGHTLESSNESS ON MINERAL SATURATION OF BONE TISSUE
I. G. Krasnykh *In its* Weightlessness: Med. and Biol. Res. (NASA-TT-F-16105) Mar. 1975 p 208-215 Transl. into ENGLISH from the book "Nevesemost: Mediko-Biologicheskiye Issledovaniye" Moscow, Meditsina Press, 1974 p 186-192 (For availability see N75-23106 14-52)
CSCL 06S

X-ray photometry of bone density established dynamic changes in mineral saturation of bone tissues for Soyuz spacecraft and Salyut orbital station crews. Calcaneus optical bone densities in all crew members fell below initial values; an increase in spacecrew exposure time to weightlessness conditions also increased the degree of decalcification. Demineralization under weightlessness conditions took place at a higher rate than under hypodynamia. G.G.

N75-23122* Kanner (Leo) Associates, Redwood City, Calif.
METHODS OF BODY ORIENTATION IN SPACE IN THE ABSENCE OF SUPPORT UNDER WEIGHTLESS CONDITIONS
A. V. Yeremin, V. I. Stepantsov, I. F. Chekidra, I. P. Borisenko, and I. A. Kolosov *In its* Weightlessness: Med. and Biol. Res. (NASA-TT-F-16105) Mar. 1975 p 216-228 Transl. into ENGLISH from the book "Nevesemost: Mediko-Biologicheskiye Issledovaniye" Moscow, Meditsina Press, 1974 p 193-203 (For availability see N75-23106 14-52)
CSCL 06S

The experience accumulated in training subjects in methods of body orientation in space indicates the necessity of clear planning of the training process. After theoretical familiarization with the principles of body orientation in space and reviewing training films, practical mastery of the body orientation methods begins with working out of the individual elements on the Zhukovskiy stool. Then, the correctness and sequence of movements are carefully mastered in water, and the motor skills are then reinforced under time deficit conditions, on the vaulting bars, trampolines, and, in the concluding stage of training, the methods of orienting the body in space in weightlessness are worked out in laboratory-aircraft, with and without the spacesuit and with and without a load. Author

N75-23123* Kanner (Leo) Associates, Redwood City, Calif.
MOTOR ACTIVITY OF ASTRONAUTS IN UNSUPPORTED STATE
I. I. Kasyan, I. A. Kolosov, and V. I. Kopanev *In its* Weightlessness: Med. and Biol. Res. (NASA-TT-F-16105) Mar. 1975 p 228-239 Transl. into ENGLISH from the book "Nevesemost: Mediko-Biologicheskiye Issledovaniye" Moscow, Meditsina Press, 1974 p 203-212 (For availability see N75-23106 14-52)
CSCL 06S

The performance quality of movements away and approaches to an airlock by astronauts was tested during parabolic flights for weightlessness simulation. Coordination of movement, orientation and performance capacity of the astronauts were not singificantly disrupted. Observed physiological shifts are characterized by an increase in pulse and respiration rate and an increase in arterial pressure under g-forces, a gradual decrease in these indices during repeated stays in weightlessness or during the prolonged effect of it, by a reduction of the length of postrotational nystagmus and counterrotation illusions under weightless conditions. Author

N75-23124* Kanner (Leo) Associates, Redwood City, Calif.
BIOELECTRIC ACTIVITY OF SKELETAL MUSCLE UNDER CONDITIONS OF ALTERNATING ACTION OF g-FORCES AND WEIGHTLESSNESS
Ye. M. Yuganov, I. I. Kasyan, and B. F. Asyamolov *In its* Weightlessness: Med. and Biol. Res. (NASA-TT-F-16105) Mar. 1975 p 239-245 Transl. into ENGLISH from the book "Nevesemost: Mediko-Biologicheskiye Issledovaniye" Moscow, Meditsina Press, 1974 p 213-218 (For availability see N75-23106 14-52)
CSCL 06S

The bioelectric activity of the musculature of animals and man was studied during alternating g-forces and weightlessness. The appropriate conditions were reproduced in flight along a parabolic curve; in this case, weightlessness lasting 25-30 sec alternated with g-forces of about 2 g magnitude. Quite regular changes in the bioelectric activity of various groups of muscles were disclosed under g-forces and in weightlessness. Thus, muscle biopotential amplitudes of 130-180 microvolt in horizontal flight, increased to 190-330 microvolt under g-forces. In the subsequent weightlessness, an abrupt reduction in oscillation voltage was observed and, in a number of cases, phenomena, similar to the picture of bioelectric silence were noted. Author

N75-23125* Kanner (Leo) Associates, Redwood City, Calif.
MOTOR ACTIVITY UNDER WEIGHTLESS CONDITIONS
I. I. Kasyan, V. I. Kopanev, M. A. Cherepakhin, and Ye. M. Yuganov *In its* Weightlessness: Med. and Biol. Res. (NASA-TT-F-16105) Mar. 1975 p 245-265 Transl. into ENGLISH from the book "Nevesemost: Mediko-Biologicheskiye Issledovaniye" Moscow, Meditsina Press, 1974 p 218-236 (For availability see N75-23106 14-52)
CSCL 06S

The material presented on the motor activity under weightless conditions (brief and long) leads to the conclusion that it is not significantly disrupted, if those being examined are secured at the workplaces. Some discoordination of movement, moderately expressed disruption of the precision of reproduction of assigned muscular forces, etc., were observed. Motor disorders decrease significantly in proportion to the length of stay under weightless conditions. This apparently takes place, as a consequence of formation of a new functional system, adequate to the conditions of weightlessness. Tests on intact and labyrinthectomized animals have demonstrated that signaling from the inner ear receptors is superfluous in weightlessness, since it promotes the onset of disruptions in the combined work of the position analyzers. Author

N75-23126* Kanner (Leo) Associates, Redwood City, Calif.
PATHOPHYSIOLOGICAL ANALYSIS OF THE EFFECT OF WEIGHTLESSNESS ON THE BODY
Ye. A. Kovalenko *In its* Weightlessness: Med. and Biol. Res. (NASA-TT-F-16105) Mar. 1975 p 265-314 Transl. into ENGLISH from the book "Nevesemost: Mediko-Biologicheskiye Issledovaniye" Moscow, Meditsina Press, 1974 p 237-278 (For availability see N75-23106 14-52)
CSCL 06S

A general scheme of pathogenesis of the effect of weightlessness on the human body is constructed that considers a shift of body fluids, decrease and change in afferent impulses, and metabolic changes in muscle and bony tissues. G.G.

N75-23127* Kanner (Leo) Associates, Redwood City, Calif.
PROPHYLAXIS OF UNFAVORABLE EFFECT OF WEIGHTLESSNESS ON THE BODY
P. V. Vasilyev *In its* Weightlessness: Med. and Biol. Res. (NASA-TT-F-16105) Mar. 1975 p 314-335 Transl. into ENGLISH from the book "Nevesemost: Mediko-Biologicheskiye Issledovaniye" Moscow, Meditsina Press, 1974 p 278-299 (For availability see N75-23106 14-52)
CSCL 06S

Artificial gravitation is judged to be the most effective universal method of prophylaxis for the negative effects of weightlessness on the human body. G.G.

N75-23128* Kanner (Leo) Associates, Redwood City, Calif.
MEANS AND METHODS OF PHYSICAL CONDITIONING OF MAN IN LONG SPACE FLIGHTS
V. I. Stepantsov, A. V. Yeremin, and M. A. Tikhonov *In its* Weightlessness: Med. and Biol. Res. (NASA-TT-F-16105) Mar. 1975 p 335-351 Transl. into ENGLISH from the book "Nevesemost: Mediko-Biologicheskiye Issledovaniye" Moscow, Meditsina Press, 1974 p 289-315 (For availability see N75-23106 14-52)
CSCL 06S

Methods of prophylaxis for disorders caused predominantly by reduction or absence of hydrostatic blood pressure in weightlessness and in experimental stimulation of it (readjustment of the watersalt metabolism, relative dehydration, disruption of competence of the cardiovascular system with respect to orthostatic loads, etc.), are adequately substantiated. Two theoretically possible approaches to prophylaxis of this type of disorder are examined: The use of methods of simulation of the effect of hydrostatic blood pressure in flight and the decrease in the gravitational redistribution of blood to the lower part of the body in the postflight period. In particular, the method of negative pressure in the lower region of the body gave favorable results. A significant decrease in orthostatic disorders after completion of such experiments was achieved by use of g-suits or other types of special clothing. Author

N75-23129* Kanner (Leo) Associates, Redwood City, Calif.
PROBLEM OF ARTIFICIAL GRAVITY FROM THE POINT OF VIEW OF EXPERIMENTAL PHYSIOLOGY
Ye. M. Yuganov and M. D. Yemelyanov *In its* Weightlessness: Med. and Biol. Res. (NASA-TT-F-16105) Mar. 1975 p 351-357 Transl. into ENGLISH from the book "Nevesemost: Mediko-Biologicheskiye Issledovaniye" Moscow, Meditsina Press, 1974 p 314-318 (For availability see N75-23106 14-52)
CSCL 06S

Artificial gravity in spacecraft and orbital stations is considered as prophylactic method for preventing disorders under weightlessness conditions and for readaptation of astronauts to the gravity of earth. The creation of 0.28 to 0.31 g artificial gravity during weightlessness is adequate to orient the human body in space, to preserve movement coordination, as well as to maintain the necessary level of certain physiological indices. This range of artificial weightiness can be reached by various angular accelerations of the satellite rotation as a function of the radius or orientation. G.G.

N75-23130* Kanner (Leo) Associates, Redwood City, Calif.
TRAINING OF ASTRONAUTS IN LABORATORY-AIRCRAFT UNDER WEIGHTLESS CONDITIONS FOR WORK IN SPACE
Ye. V. Khrunov, I. F. Chekidra, and I. A. Kolosov *In its* Weightlessness: Med. and Biol. Res. (NASA-TT-F-16105) Mar. 1975 p 357-365 Transl. into ENGLISH from the book "Nevesemost: Mediko-Biologicheskiye Issledovaniye" Moscow, Meditsina Press, 1974 p 318-325 (For availability see N75-23106 14-52)
CSCL 05E

Analyses of occupational activities of astronauts in laboratory-aircraft flights simulating weightlessness conditions permit the development of training methods and optimization of the interaction of man with various spacecraft designs. G.G.

N75-23131* Kanner (Leo) Associates, Redwood City, Calif.
PRESERVATION OF HUMAN PERFORMANCE CAPACITY UNDER PROLONGED SPACE FLIGHT CONDITIONS
A. V. Yeremin, R. M. Bogdashevskiy, and Ye. F. Baburin *In its* Weightlessness: Med. and Biol. Res. (NASA-TT-F-16105) Mar. 1975 p 365-383 Transl. into ENGLISH from the book "Nevesemost: Mediko-Biologicheskiye Issledovaniye" Moscow, Meditsina Press, 1974 p 325-341 (For availability see N75-23106 14-52)
CSCL 06S

Prophylactic measures directed toward preservation of health and maintenance of the performance ability of a man during prolonged space flight stress center on the selection of optimum work and rest cycles, physical exercises, the use of pharmacological agents, conditioning of the cardiovascular apparatus, etc. A specially selected set of hormone and pharmacological preparations is recommended to stimulate hemopoiesis. G.G.

N75-23132* Kanner (Leo) Associates, Redwood City, Calif.
ASTRONAUT ACTIVITY IN WEIGHTLESSNESS AND UNSUPPORTED SPACE
Ye. A. Ivanov, V. A. Popov, and L. S. Kachaturyants *In its* Weightlessness: Med. and Biol. Res. (NASA-TT-F-16105) Mar. 1975 p 383-429 Transl. into ENGLISH from the book "Nevesemost: Mediko-Biologicheskiye Issledovaniye" Moscow, Meditsina Press, 1974 p 341-380 (For availability see N75-23106 14-52)
CSCL 06S

For the purpose of study of the performance ability of a human operator in prolonged weightless conditions was studied by the following methods: (1) psychophysiological analysis of certain operations; (2) the dynamic characteristics of a man, included in a model control system, with direct and delayed feedback; (3) evaluation of the singularities of analysis and quality of the working memory, in working with outlines of patterned and random lines; and (4) biomechanical analysis of spatial orientation and motor activity in unsupported space. Author

N75-23133* Kanner (Leo) Associates, Redwood City, Calif.
SOME RESULTS OF BIOMEDICAL STUDIES CARRIED OUT IN THE GEMINI AND APOLLO PROGRAMS
V. I. Kopanev and Ye. M. Yuganov *In its* Weightlessness: Med. and Biol. Res. (NASA-TT-F-16105) Mar. 1975 p 429-482 Transl. into ENGLISH from the book "Nevesemost: Mediko-Biologicheskiye Issledovaniye" Moscow, Meditsina Press, 1974 p 385-428 (For availability see N75-23106 14-52)
CSCL 06S

Biomedical changes in Gemini and Apollo astronauts indicate physiological shifts in the majority of organs and systems of the body during space flight. Weightlessness conditions affected body weight, blood circulation, hematological indices, metabolisms, etc. Prophylactic measures to minimize the various physiological and psychological effects constitute activity and rest cycles, supplementary potassium addition to space food, artificial gravity, etc. G.G.

N75-23134*# Kanner (Leo) Associates, Redwood City, Calif.
LIFE IN WEIGHTLESSNESS
J. Lavernhe Washington NASA May 1975 5 p Transl. into ENGLISH from Presse Med. (Paris), no. 48, 13 Nov. 1971 p 2190
(Contract NASw-2481)
(NASA-TT-F-16361) Avail: NTIS HC $3.25 CSCL 06S

Organic disorders arising during extended space flights are discussed, including the medical and psychological aspects of weightlessness. The environment of the Skylab station is also described. Author

N75-23135*# Scientific Translation Service, Santa Barbara, Calif.
PERIODS OF MAXIMUM PEFORMANCE AND CIRCADIAN RHYTHM OF PHYSIOLOGICAL FUNCTIONS
V. A. Doskin and N. A. Lavrentyeva Washington NASA May 1975 11 p refs Transl. into ENGLISH from Sov. Med. (USSR), v. 8, Aug. 1974 p 140-145
(Contract NASw-2483)
(NASA-TT-F-16310) Avail: NTIS HC $3.25 CSCL 06P

An investigation is made of maximum performance and circadian rhythm of physiological functions in students of the Moscow Medical Institute. It is concluded that periods of high performance are determined by the circadian rhythm of physiological functions. Author

N75-23136*# Scientific Translation Service, Santa Barbara, Calif.
CIRCADIAN FLUCTUATIONS IN THE NUMBER OF THROMBOCYTES IN PATIENTS WITH ACUTE MYOCARDIAL INFARCTION
R. M. Zaslavskaya and Ye. G. Perepelkin Washington NASA May 1975 5 p Transl. into ENGLISH from Ter. Arkh. (USSR), v. 46, no. 6, 1974 p 94-96
(Contract NASw-2483)
(NASA-TT-F-16309) Avail: NTIS HC $3.25 CSCL 06E

The quantitative dynamics of thrombocytes in patients with acute myocardial infarction is studied. The studies showed that there is a definite rhythmicity of circadian fluctuations in the number of thrombocytes in healthy individuals. In patients with acute myocardial infarction, the rhythmicity is distorted. Author

N75-23137*# Scientific Translation Service, Santa Barbara, Calif.
CIRCADIAN RHYTHM OF PHYSIOLOGICAL FUNCTIONS IN CLINOSTATIC HYPOKINESIA
V. M. Koroleva-Munts Washington NASA May 1975 10 p refs Transl. into ENGLISH from Fiziol. Zh. SSSR (USSR), v. 60, no. 8, 1974 p 1145-1149
(Contract NASw-2483)
(NASA-TT-F-16308) Avail: NTIS HC $3.25 CSCL 06S

In the first 10 days of a strict bed regime (for medical reasons) changes were noted in the circadian rhythm of the heart rate, body temperature, minute volume of respiration and openness of the bronchial passages. By the 19-21st day in bed initial rhythms of the first three indices reappeared. Changes in the character of individual rhythm curves and correlations between rhythms of heart rate and body temperatures were statistically significant while no significant differences were found for mean values of sinusoid amplitude and phase with which empirical curves of rhythms were approximated. Author

N75-23138*# Kanner (Leo) Associates, Redwood City, Calif.
SOME PECULIARITIES OF INTRACARDIAC AND INTRACEREBRAL HEMOCIRCULATION IN PATIENTS SUFFERING FROM RHEUMATOID ARTHRITIS
I. Ye. Oranskiy and L. A. Kozlova Washington NASA May 1975 11 p refs Transl. into ENGLISH from Vop. Revmatizma (USSR), no. 3, Jul. - Sep. 1974 p 47-52
(Contract NASw-2481)
(NASA-TT-F-16307) Avail: NTIS HC $3.25 CSCL 06E

The indices of intracardiac and intracerebral hemodynamics and the rhythm of their diurnal changes were studied in 225 patients suffering from rheumatoid arthritis. Serious disorders were shown in the systemic and regional blood circulation and intracardiac hemodynamics, cuased by a general pathological process. The relation between frequency of change in the cerebral hemocirculation and condition of the cardiovascular system on the whole was discussed. Author

N75-23139*# Scientific Translation Service, Santa Barbara, Calif.
FITNESS FOR AIR TRAVEL, THE MEDICAL POINT OF VIEW
H. H. Renemann, K. Wink, and H. Reindell Washington NASA May 1975 13 p refs Transl. into ENGLISH from Med. Klin. (Munich), v. 69, no. 32/33, 1974 p 1311-1316
(Contract NASw-2483)
(NASA-TT-F-16304) Avail: NTIS HC $3.25 CSCL 06E

The stresses of air travel on medical patients are described as well as the airlines' obligation with respect to transporting patients. A number of heart, circulation system and other diseases are evaluated with respect to air travel safety. Author

N75-23140*# Scientific Translation Service, Santa Barbara, Calif.
ON ROD AND CONE VISUAL ACUITY
Felix Koester Washington NASA Apr. 1975 7 p Transl. into ENGLISH from Centrablatt fur Physiol., v. 10, no. 15, 17 Oct. 1896 p 433-436
(Contract NASw-2483)
(NASA-TT-F-16303) Avail: NTIS HC $3.25 CSCL 06P

Dark and light visual acuity of various parts of the eye were determined. Results were compared with the theory. Author

N75-23141*# Kanner (Leo) Associates, Redwood City, Calif.
STUDIES AND INVESTIGATIONS. DAILY VARIATIONS OF URINARY EXCRETION OF 5-HYDROXY-INDOLE-ACETIC ACID IN NORMAL SUBJECTS
R. Fogari, C. Goi, and L. Corradi Washington NASA Apr. 1975 7 p refs Transl. into ENGLISH from Arch. Sci. Med. (Italy), v. 131, no. 2, Apr. - Jun. 1974 p 57-59
(Contract NASw-2481)
(NASA-TT-F-16302) Avail: NTIS HC $3.25 CSCL 06P

Urinary excretion of 5-hydroxy-indole-acetic acid, the main catabolite of 5-HT, was studied in 25 normal males at 8-hour intervals in the search for a circadian pattern. The method of Udenfriend was employed. A maximum nocturnal value and a minimum value between 8 a.m. and 4 p.m. were noted. The differences lacked significance. Author

N75-23142*# Kanner (Leo) Associates, Redwood City, Calif.
BRIGHTNESS SENSATION IN INDIRECT VISION
A. Kirschmann Washington NASA May 1975 44 p refs Transl. into ENGLISH from Phil. Stud., v. 5, 1888-1889 p 447-497
(Contract NASw-2481)
(NASA-TT-F-16286) Avail: NTIS HC $3.75 CSCL 06P

Sensitivity to brightness is greater in the peripheral regions of the retina than in the center. This sensitivity is a maximum at a certain distance from the center, which depends on the direction, and then slowly declines further out. The peripheral retina is more sensitive than the center to rapid motion. In order to make the alternating sectors of a rotating disc blend into one another, a higher rate of rotation is required in indirect vision than in direct vision. These properties of the eye seem useful for vision, and offer substantial advantages with respect to perception of objects upon which the eye is not fixed and of motions occurring at the boundaries of the field of vision. It is very likely that the outer segments of the rods, acting as catoptric instruments, bring about this increased sensitivity of the retinal periphery, which would also explain the different distribution of rods and cones in the human retina. Author

N75-23143*# Kanner (Leo) Associates, Redwood City, Calif.
VALIDITY OF DETERMINATION OF DIURNAL CORTISOL PRODUCTION RATE BY ISOTOPE DILUTION METHOD
W. Massalski Washington NASA Apr. 1975 10 p refs Transl. into ENGLISH from Pol. Arch. Med. Wewn. (Poland), v. 4, no. 52, 1972 p 329-334
(Contract NASw-2481)
(NASA-TT-F-16285) Avail: NTIS HC $3.25 CSCL 06E

Examined is a basic assumption made in all methods attempting to determine the diurnal cortisol production rate by determination of the specific activity of one of its metabolites, namely that the radioactive steroid is metabolized in the same pathways and in an identical manner as its nonradioactive counterparts. It is shown that the presence of the radioactive isotope may lead to considerable changes in enzymatic activity. Since the specific activity of different cortisol metabolites determined in one person is not the same, the differences being as high as 60 percent of the value, there is no theoretical basis for an accurate determination of the diurnal cortisol production rate by the isotope dilution method. Author

N75-23144*# Scientific Translation Service, Santa Barbara, Calif.
AEROBIOCONTAMINATION EMITTED BY A PERSON PLACED IN A LAMINAR FLUX CHAMBER
J. D. Joubert, J. Citterio, B. Dewimille, and E. Lefort Washington NASA May 1975 12 p Transl. into ENGLISH from Lyon Chirurgical (France), v. 70, no. 5, 1974 p 349-351
(Contract NASw-2483)
(NASA-TT-F-16284) Avail: NTIS HC $3.25 CSCL 06P

Laminar air flux systems for surgery operating rooms are evaluated and compared with classical systems, from the standpoint of effectiveness against contamination. Author

N75-23145*# North Carolina State Univ., Raleigh.
THE UTILIZATION OF HABROBRACON AND ARTEMIA AS EXPERIMENTAL MATERIALS IN BIOASTRONAUTIC STUDIES Final Report
D. S. Grosch Sep. 1972 62 p refs
(Contract NAS2-6684)
(NASA-CR-114590) Avail: NTIS HC $4.25 CSCL 06F

In the reproductive performance of female braconids striking

contrasts were revealed between the results from the actual biosatellite flight and those from experiments when the recovered vehicle was subjected to the forces of simulated launching and recovery. Second week decreases in egg production due to the radiation damage of cells in mitosis were minimized for the females irradiated during space flight. It was demonstrated that females irradiated for two days during orbital flight laid as many eggs during the second week as the unirradiated ground-based controls. After the 10th day their oviposition records exceeded control values. The hatchability of eggs deposited by Biosatellite II females was excellent. Explanations were sought for the space flight's cancellation of the characteristic radiation-induced decrease in egg production, and for the exceptionally good hatchability of eggs derived from most of the cell types in the irradiated ovarioles. Eggs from only two classes of cells showed enhanced embryonic lethality: those poised in meiotic metaphase during their mother's orbital flight, and those from oocytes beginning vitellogenesis. Author

N75-23146*# Scientific Translation Service, Santa Barbara, Calif.
EXPERIMENTAL STUDY OF PHYSIOLOGICAL VARIATIONS IN URINARY SODIUM AND POTASSIUM RELATED TO TIME ZONE CHANGES
J. P. Chevrier Washington NASA May 1975 8 p refs Transl. into ENGLISH from Compt. Rend. Soc. Biol. (Paris), v. 167, no. 12, 1973 p 2014-2018
(Contract NASw-2483)
(NASA-TT-F-16281) Avail: NTIS HC $3.25 CSCL 06P

Time zone shift experiments associated with aircraft travel were simulated. Twenty-day experiments were carried out with four subjects under controlled conditions. Recovery of functions was found to take place within 5 to 7 days after the tests. Author

N75-23147*# Scientific Translation Service, Santa Barbara, Calif.
THE EFFECT OF TRYPTOPHAN ON THE SOMATOTROPIC HORMONE DURING SLEEP IN SCHIZOPHRENICS
L Murri, G. Cerone, F. Feriozzi, G. M. Mancini, and A. Nurzia Washington NASA May 1975 8 p refs Transl. into ENGLISH from Boll. Soc. Ital. Biol. Sper. (Naples), v. 49 , no. 24, 30 Dec. 1973 p 1490-1495
(Contract NASw-2483)
(NASA-TT-F-16280) Avail: NTIS HC $3.25 CSCL 06E

It is determined whether tryptophan administration during sleep is able to induce a release of the somatotropic hormone in schizophrenic subjects. Author

N75-23148*# Scientific Translation Service, Santa Barbara, Calif.
DIURNAL VARIATIONS OF THE PHYSIOLOGICAL MOBILITY OF HUMAN TEETH
H. Schnell and J. Greif Washington NASA Apr. 1975 7 p Transl. into ENGLISH from Deut. Zahnaertztl. Z. (East Germany), v. 29, no. 9, Sep. 1974 p 879-880
(Contract NASw-2483)
(NASA-TT-F-16277) Avail: NTIS HC $3.25 CSCL 06P

An experimental system for measuring the diurnal variation of the physiological mobility of human teeth is reported, based on strain gages. The major result of the studies is that the physiological mobility of the teeth is subject to spontaneous rhythmic variations with a cycle of 48 hours. Author

N75-23149*# Scientific Translation Service, Santa Barbara, Calif.
RADIATION AND PROTECTION
U. Ya. Margulis Washington NASA Apr. 1975 174 p refs Transl. into ENGLISH from the book "Radiatsiya i Zashchita" Moscow, Atomizdat, 1974 p 160
(Contract NASw-2483)
(NASA-TT-F-16209) Avail: NTIS HC $6.25 CSCL 06R

Described are the interaction of ionizing radiation with matter, the action of radiation on living organisms, and the protective measures necessary in working with radioactive materials and with sources of ionizing radiation. Information regarding atomic structure and nature of the interaction of radiation with matter are presented. Author

N75-23150# Advisory Group for Aerospace Research and Development, Paris (France).
SPINAL INJURY AFTER EJECTION
R. Auffret and R. P. Delahaye Feb. 1975 59 p refs
(AGARD-AR-72) Avail: NTIS HC $4.25

The statistical results of a survey conducted by 7 NATO Nations are analyzed, and the death rate as well as the rate and distribution of rachis fractures are given. Anatomical and physiological aspects are reviewed, and the pathogenic mechanism of fractures is discussed. In most cases, it is difficult to determine whether the rachis fractures occur when the seat is released or at landing. The pilot's position in the seat plays a fundamental role in the success of the ejection. The radiological aspects of rachis fractures are described, and the stress is laid on the difference between stable and unstable fractures. The therapy applied and the durations of unavailability from duty are indicated. An X-ray examination of the whole spine is recommended after each ejection. Author

N75-23151# Oak Ridge National Lab., Tenn.
CALCULATIONAL TECHNIQUES FOR ESTIMATING POPULATION DOSES FROM RADIOACTIVITY IN NATURAL GAS FROM NUCLEARLY STIMULATED WELLS
C. J. Barton, R. E. Moore, P. S. Rohwer, and S. V. Kaye 1974 25 p refs Presented at the Fourth IAEA Panel on Peaceful Nuclear Explosives, Vienna, Austria, 20 Jan. 1975
(Conf-750109-1) Avail: NTIS HC $3.25

Techniques for estimating radiation doses from exposure to combustion products of natural gas obtained from wells created by use of nuclear explosives were first developed in the Gasbuggy Project. These techniques were refined and extended by development of a number of computer codes in studies related to the Rulison Project, the second in the series of joint government-industry efforts to demonstrate the feasibility of increasing natural gas production from low permeability rock formations by use of nuclear explosives. These techniques are described and dose estimates that illustrate their use are given. These dose estimation studies have been primarily theoretical, but the hypothetical exposure conditions correspond as closely as possible with conditions that could exist if nuclearly stimulated natural gas is used commercially. Author (NSA)

N75-23152# Institut Franco-Allemand de Recherches, St. Louis (France).
INVESTIGATIONS ON THE PROBLEM OF SLEEP DISTURBANCES CAUSED BY SUPERSONIC BOOMS [EXPERIMENTELLE UNTERSUCHUNGEN ZUM PROBLEM DER SCHLAFSTOERUNGEN DURCH UEBERSCHALLKNALL]
G. Jansen and B. Griefahn 2 Jul. 1974 37 p refs In GERMAN
(Contract DRME-72/693)
(ISL-21/74) Avail: NTIS HC $3.75

The influence of supersonic booms, generated in a hypersonic wind tunnel, on the natural sleep of two probands, notably on the profoundness of the sleep, on the total sleeping process and on the peripheral circulation was investigated. The booms cause a significant and regular increase of the cerebral electric activity. As the sleep is more profound the intensity and the duration of the reaction is higher. The shorter the interval between two booms becomes, the weaker is the effect on the stimulus. Habituation to supersonic booms did not occur. ESRO

N75-23153# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
THE EFFECT OF FLARE DRIFT ON TARGET ACQUISITION PERFORMANCE Final Report
Russell A. Sorensen Oct. 1974 30 p refs
(AF Proj. 7184)
(AD-A006756; AMRL-TR-74-73) Avail: NTIS CSCL 17/8

Thirty male college students participated in an experiment to determine the effect of three velocities of flare drift (0, 5, and 10 knots) on target acquisition performance measured by number of targets detected. Additionally, acquisition performance was evaluated as a function of incentive pay for targets acquired, slant range, and target type. The experiment utilized terrain model simulation techniques, a simulated slow speed (100 knots) aircraft at 2,000-ft AGL and a simulated 2,000,000 candlepower LUU-2B/B parachute flare. GRA

N75-23085 Advisory Group for Aerospace Research and Development, Paris (France).

MEDICAL REQUIREMENTS AND EXAMINATION PROCEDURES IN RELATION TO THE TASKS OF TODAY'S AIRCREW: INTRODUCTORY REMARKS
Aristice Scano *In its* Med. Requirements and Exam. Procedures in Relation to the Tasks of Today's Aircrew Feb. 1975 3 p refs (For availability see N75-23084 14-51)

N75-23086 Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
EVALUATION OF ROLL AXIS TRACKING AS AN INDICATOR OF VESTIBULAR/SOMATO SENSORY FUNCTION
A. M. Junker and C. R. Replogle *In* AGARD Med. Requirements and Exam. Procedures in Relation to the Tasks of Today's Aircrew Feb. 1975 8 p refs (For availability see N75-23084 14-51)

N75-23087 Institute of Aviation Medicine, Fuerstenfeldbruck (West Germany).
THE EFFECTS OF PURE TONE HEARING LOSSES ON AVIATORS' SENTENCE INTELLIGIBILITY IN QUIET AND IN AIRCRAFT NOISE
G. R. Froelich *In* AGARD Med. Requirements and Exam. Procedures in Relation to the Tasks of Today's Aircrew Feb. 1975 4 p (For availability see N75-23084 14-51)

N75-23088 Naval Aerospace Medical Research Lab., Pensacola, Fla. Acoustical Sciences Div.
ASSESSING AN AVIATOR'S ABILITY TO HEAR SPEECH IN HIS OPERATIONAL ENVIRONMENT
Carl E. Williams, James D. Mosko, and James W. Greene *In* AGARD Med. Requirements and Exam. Procedures in Relation to the Tasks of Today's Aircrew Feb. 1975 10 p refs (For availability see N75-23084 14-51)

N75-23090 Centre Principal d'Expertises Medicales du Personnel Navigant, Paris (France).
THE ROLE OF VOCAL AUDIOMETRY IN THE SELECTION OF NAVIGATION PERSONNEL [LA PART DE L'AUDIOMETRIE VOCALE DANS LA SELECTION DU PERSONNEL NAVIGANT]
P. Blanc and J. D. P. Bastien *In* AGARD Med. Requirements and Exam. Procedures in Relation to the Tasks of Today's Aircrew Feb. 1975 3 p In FRENCH (For availability see N75-23084 14-51)

N75-23091 Erlangen-Nuremberg Univ. (West Germany). Dept. of Physiology.
OBJECTIVE ELECTROPHYSIOLOGICAL MEASUREMENTS OF EAR CHARACTERISTICS, INTELLIGIBILITY OF VOWELS AND JUDGEMENT OF THE STAGE OF ATTENTION
Manfred Spreng *In* AGARD Med. Requirements and Exam. Procedures in Relation to the Tasks of Today's Aircrew Feb. 1975 10 p refs (For availability see N75-23084 14-51)

N75-23092 Italian Air Force Medico-Legal Inst., Milan.
THE IMPORTANCE OF THE DOSAGE OF THIOCYANATES IN URINE AND BLOOD OF FLYING PERSONNEL FOR THE PREVENTION OF DISEASES OF VISUAL FUNCTION
G. Durazzini, F. Zazo, and G. Bertoni (Milan Univ.) *In* AGARD Med. Requirements and Exam. Procedures in Relation to the Tasks of Today's Aircrew Feb. 1975 5 p refs (For availability see N75-23084 14-51)

N75-23093 Dunlap and Associates, Inc., la Jolla, Calif.
EVALUATION OF THE SPECIAL SENSES FOR FLYING DUTIES: PERCEPTUAL ABILITIES OF LANDING SIGNAL OFFICERS (LSOS)
C. A. Brictson *In* AGARD Med. Requirements and Exam. Procedures in Relation to the Tasks of Today's Aircrew Feb. 1975 8 p refs (For availability see N75-23084 14-51)

N75-23094 Naval Aerospace Medical Research Lab., Pensacola, Fla. Aerospace Psychology Dept.
AIR-TO-AIR VISUAL TARGET ACQUISITION
James E. Goodson *In* AGARD Med. Requirements and Exam. Procedures in Relation to the Tasks of Today's Aircrew Feb. 1975 9 p refs (For availability see N75-23084 14-51)

N75-23095 Centro di Studi e Ricerche di Medicina Aeronautica e Spaziale, Rome (Italy).
VISUAL ACUITY OF ASTIGMATIC SUBJECTS AND FITNESS TO AIR FORCE SERVICE
Paolo Rota and Carlo Terrana *In* AGARD Med. Requirements and Exam. Procedures in Relation to the Tasks of Today's Aircrew Feb. 1975 3 p refs (For availability see N75-23084 14-51)

N75-23096 School of Aerospace Medicine, Brooks AFB, Tex. Ophthalmology Branch.
MICROSTRABISMUS IN FLYING PERSONNEL (DIAGNOSIS AND DISPOSITION)
Thomas J. Tredici *In* AGARD Med. Requirements and Exam. Procedures in Relation to the Tasks of Today's Aircrew Feb. 1975 10 p refs (For availability see N75-23084 14-51)

N75-23097 Amsterdam Univ. (Netherlands).
LINEAR ACCELERATION PERCEPTION THRESHOLD DETERMINATION WITH THE USE OF A PARALLEL-SWING
A. J. Greven, W. J. Oosterveld, and W. J. A. C. Rademakers *In* AGARD Med. Requirements and Exam. Procedures in Relation to the Tasks of Today's Aircrew Feb. 1975 4 p refs (For availability see N75-23084 14-51)

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N75-23154 North Carolina State Univ., Raleigh.
THE COMBINED EFFECTS OF NOISE AND VIBRATION ON HUMAN ANNOYANCE Ph.D. Thesis
Michael Jerome Goodman 1974 149 p
Avail: Univ. Microfilms Order No. 75-7724

The nature of the influence of one stimulus (noise, vibration) upon judged annoyance to a second stimulus (vibration, noise) on human subjects was evaluated. An evaluation was also made to determine the combined annoyance of noise and vibration individually. The importance of sensitivity to noise and vibration, differences in response between the sexes, and the relationship between changes in heart rate and annoyance were also considered. Results show a number of significant relationships discovered between (a) the manner in which noise and vibration interact subjectively, and (b) situational (e.g., the nature of the variables. Results also show uniformity in response (cardiac deceleration) between subjects, with some dependence of changes on rate and upon the nature of the stimulus. It is concluded that annoyance is most adequately defined in terms of an intrusion into an ongoing activity which results in emotional and/or physical discomfort. Dissert. Abstr.

N75-23155 Minnesota Univ., Minneapolis.
A COMPARISON OF ALTERNATIVE DESENSITIZATION PROCEDURES FOR TREATMENT OF FLIGHT PHOBIA Ph.D. Thesis
Sylvia Jane Solberg 1974 174 p
Avail: Univ. Microfilms Order No. 75-2152

An evaluation of the efficacy of two preprogrammed, automated group desensitization treatments for the fear of flying was performed. Treatments were preprogrammed in that hierarchy items and rates of item presentation were determined prior to treatment, and the treatments were automated in that all desensitization sessions were presented via tape recordings. Positive data indicates that group, preprogrammed, automated desensitization is an efficacious treatment for the fear of flying. Conclusions revealed by the study are: (1) flight phobics tend to experience most flight fear prior to and during take-off and ascent of the plane. (2) Treatment for the fear of flying led to post-treatment changes specific to flight phobia, but did not influence other personality traits, such as anxiety or neuroticism. Dissert. Abstr.

N75-23156 Indiana Univ., Bloomington.
STRESS AND TASK PERFORMANCE: A COMPARISON

OF PHYSICAL AND PSYCHOLOGICAL STRESSORS Ph.D. Thesis
Herschel Nehemiah Chait 1974 102 p
Avail: Univ. Microfilms Order No. 75-8933

The failure of a stressor to affect motor task performance was explained by the assumed sensitivity of the motor task to such influences as ability and fatigue, and by the short duration of the task. A cognitive task was assumed to be less sensitive to these influences. the finding that only two of the measures of cognitive performance were affected by the stressors was explained as being the result of stressors influencing measures of speed, but not of accuracy. It was concluded that same stress state, cannot be unambiguously answered by the data collected in this study. It was also noted that some multivariate techniques, which are used for the development of taxonomies of situations, may provide another method of answering this basic question. Dissert. Abstr.

N75-23157*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
EFFECTS OF THREE ACTIVITIES ON ANNOYANCE RESPONSES TO RECORDED FLYOVERS
Walter J. Gunn, William T. Shepherd, and John L. Fletcher (Memphis State Univ., Tenn.) Apr. 1975 47 p refs
(NASA-TM-X-72673) Avail: NTIS HC $3.75 CSCL 05E

Human subjects participated in an experiment in which they were engaged in TV viewing, telephone listening, or reverie (no activity) for a 1/2-hour session. During the session, they were exposed to a series of recorded aircraft sounds at the rate of one flight every 2 minutes. At each session, four levels of flyover noise, separated by 5 db increments were presented several times in a Latin Square balanced sequence. The peak levels of the noisiest flyover in any session was fixed at 95, 90, 85, 75, or 70 db. At the end of the test session, subjects recorded their responses to the aircraft sounds, using a bipolar scale which covered the range from very pleasant to extremely annoying. Responses to aircraft noises are found to be significantly affected by the particular activity in which the subjects are engaged.
Author

N75-23158# Defence and Civil Inst. of Environmental Medicine, Downsview (Ontario).
SPECULATIONS ON BILINGUALISM AND THE COGNITIVE NETWORK
M. M. Taylor Mar. 1974 59 p refs Repr. from Working Papers on Bilingualism (Toronto), Issue 2, Mar. 1974 p 68-124
(DCIEM-74-RP-1013) Avail: NTIS HC $3.75

A theory on the cognitive network of human language development is expounded. The network consists of concepts linked together by relationships which are themselves concepts. Concepts are learned according to simple rules, and the network grows as new concepts are learned. Lower level concepts are stabilized and become parts of patterns which form higher level concepts. The growth and structure of language is also discussed. The growth of language within the network follows the same rules as the growth of perceptual ability. Labels are attached to some concepts, programs. Some problems of bilingualism are also considered. The growth of two languages at once presents special problems to the infant. Instead of linking labels and syntactic programs directly to concepts in the network, his linkages depend on conversation with other humans. The bilingual infant should have early difficulty with language, but should eventually derive a richer concept structure than the monolingual infant.
Author

N75-23159# Illinois Univ., Savoy. Aviation Research Lab.
A THEORETICAL AND EMPIRICAL COMPARISON OF TWO MIXED FACTOR CENTRAL COMPOSITE DESIGNS
Christine Clark Oct. 1974 12 p refs
(Contract F44620-70-C-0105; AF Proj. 9778; AF Proj. 6813) (AD-A007004; ARL-74-16/AFOSR-74-11; AFOSR-75-0386TR) Avail: NTIS CSCL 05/9

This paper provides a brief review of the application of central-composite designs (CCD) in human performance research. Particular mention is made of the mixed-factor CCD, which allows simultaneous consideration of within-subject and between-subjects factors. The current paper details the construction of two alternative versions of such a design. After the two versions have been compared on theoretical grounds, an empirical investigation is proposed to determine the relative predictive accuracy and validity of prediction equations derived from data collected in accordance with each design version. GRA

N75-23160# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SCIENTIFIC TECHNICAL REVOLUTION AND CHANGE IN STRUCTURE OF SCIENTIFIC PERSONNEL IN THE USSR, APPENDIX
K. M. Varsharskii 29 Jan. 1975 108 p refs Transl. into ENGLISH from the monograph "Nauchno-Tekhnicheskaya Revolyutsiya i Izmenenie Struktury Nauchnykh Kadrov SSSR" Moscow, 1973 p 128-199
(AD-A006556; FTD-HC-23-2304-74) Avail: NTIS CSCL 05/9

Contents: Principal sources of data in studying the structure and dynamics of scientific personnel in the U.S.S.R.; Mathematical methods for studying the structure and dynamics of scientific personnel; Methods of forecasting the number and structure of scientific personnel. GRA

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N75-23161 Iowa State Univ. of Science and Technology, Ames.
SPECTRAL ANALYSIS OF BIOLOGICAL SIGNALS USING COHERENT OPTIKAL TECHNIQUES Ph.D. Thesis
Robert Frank Cannata 1974 195 p
Avail: Univ. Microfilms Order No. 75-10468

The utility of coherent optical parallel processing techniques for the analysis of real one dimensional biological signals as an alternate to the digital computer methods was investigated. Data input formats suitable for optical processing are evaluated. The primary methods were area and density modulation of the amplitude transmittance of photographic film transparencies. The optical system used consisted of a He-Ne laser, a spatial filter used to produce a diverging beam, and a thin converging lens. A transparency placed in the converging beam has its diffraction pattern focused on a specific plane. The light distribution at this plane is proportional to the Fourier transform of the data on the transparency. It was found that such transparencies produced by use of 16 mm movie sound track records, photographing amplitude modulated rectilinear paper chart records, and photographing chart records manually darkened beneath the signal were effective for spectral analysis of such signals as ECG, EEG, blood flow, etc. A method was also developed for optical computation of convolution and correlation functions based on spectral description of the input data. Dissert. Abstr.

N75-23162 Ohio State Univ., Columbus.
COMPUTER-TELEVISION ANALYSIS OF BIPED LOCOMOTION Ph.D. Thesis
In-Sheng Cheng 1974 147 p
Avail: Univ. Microfilms Order No. 75-11329

By making use of a television camera as a detecting device, an interface was built to connect the television camera to a PDP-11 minicomputer. Tiny pin lights were attached to the anatomically significant landmarks on the human subject such as hip, knee, and ankle joints. The positions of the pin lights are transformed into corresponding x and y coordinates by the interface and stored in the computer. From the coordinate information of the landmarks, important parameters associated with locomotion, such as hip angle, knee angle, and ankle angle, can be obtained. Fourier series and least-square polynomial regression techniques were used to smooth the parameters obtained directly from the calculations of the raw data. The angle diagrams can be plotted on a CALCOMP plotter or the values of the angles can be fed to the kinematic model of human locomotion to simulate the same walking characteristics as those of the human subject. Dissert. Abstr.

N75-23163*# Analytical Research Labs., Inc., Monrovia, Calif.
DEVELOPMENT OF SPACECRAFT TOXIC GAS REMOVAL AGENTS Annual Summary Report
R. Starnes Moore Dec. 1974 73 p refs
(Contract NAS9-13746)
(NASA-CR-141757; ARLI-3006-S) Avail: NTIS HC $4.25 CSCL 06K

The development of agents suitable for removal of CO, NH3, NO2 SO2, and other spacecraft contaminants was approached. An extensive technology review was conducted, yielding a large number of potentially useful materials and/or concepts. Because the two toxic gases of greatest interest, CO and NH3, suggested the use of catalysis principles emphasis was placed on the intestigation of transition metals on various supports. Forty-three materials were prepared or obtained and 25 were tested. Gas chromatographic techniques were used to find seven candidates that effectively managed various combinations of the four toxic gases: none managed all. These candidates included six transition metal-containing preparations and a supported LiOH material. Three commercial charcoals showed some efficiency for the toxic gases and may constitute candidates for enhancement by doping with transition metals. Author

N75-23164*# Scientific Translation Service, Santa Barbara, Calif.
LIFE AND WORK ON BOARD A SPACE STATION
I. Pestov May 1975 8 p Transl. into ENGLISH from Aviatsiya i Kosmonavtika (USSR), no. 11, Nov. 1974 p 38-39
(Contract NASw-2483)
(NASA-TT-F-16283) Avail: NTIS HC $3.25 CSCL 05H

The daily routine of the cosmonauts is reviewed and their medical and exercise program is discussed. The cosmonaut's working day began at about 9:00 a.m. and ended at about 1:00 a.m. The medical equipment used included: Polinom for recording EKG; arterial Reseda for determining pulmonary ventilation and volume; and Impuls for evaluating vestibular apparatus function by determining threshold amounts of electrical stimulation creating an illusion of pitching. The taste sensitivity of the tongue was also examined. Reconstitution of freeze-dried food was studied. The exercise and anti-gravity suits are described. Author

N75-23165*# General Electric Co., Houston, Tex.
CREW INTERFACE SPECIFICATIONS DEVELOPMENT FOR INFLIGHT MAINTENANCE AND STOWAGE FUNCTIONS Final Report
John G. Carl 12 Nov. 1974 152 p refs
(Contract NAS9-13375)
(NASA-CR-141775) Avail: NTIS HC $6.25 CSCL 05H

Findings and data products developed during crew specification study for inflight maintenance and stowage functions are reported. From this information base, a family of data concepts to support crew inflight troubleshooting and corrective maintenance activities was developed and specified. Recommendations are made for the improvement of inflight maintenance planning, preparations and operations in future space flight programs through the establishment of an inflight maintenance organization and specific suggestions for techniques to improve the management of the inflight maintenance function. Author

N75-23166# Advisory Group for Aerospace Research and Development, Paris (France).
STANDARDISATION OF IMPACT TESTING OF PROTECTIVE HELMETS A Working Group Report
D. H. Glaister, ed. Feb. 1974 14 p refs
(AGARD-R-629) Avail: NTIS HC $3.25

Standardization of biodynamic impact testing on aircrew helmets is considered. A classification of currently used test procedures is attempted and a compromise approach is proposed which could form the basis for agreement within the NATO membership. In addition to impact protection, penetration resistance and helmet retention, it specifies requirements for blast protection, maximum all-up weight and location of helmet's center of gravity. Author

N75-23167# Utah Univ., Salt Lake City. Inst. for Biomedical Engineering.
BIOMEDICAL ENGINEERING SUPPORT
W. J. Kolff 1974 149 p refs
(Contract AT(11-1)-2155)
(COO-2155-13) Avail: NTIS HC $5.75

The development of an artificial heart is reported. A total of ten heart replacement experiments in calves was conducted using the bench model blood pump. Both an externally and internally (in the abdomen) located electric motor was used to drive the blood pump. The ultimate goal is to develop a fully implantable artificial heart for humans powered by a Pu-238 heat source. NSA

N75-23168# School of Aerospace Medicine, Brooks AFB, Tex.
PORTABLE OXYGEN-CONTAMINANT DETECTOR: DEVELOPMENT TEST AND EVALUATION Interim Report, Oct. 1973 - Oct. 1974
Kenneth G. Ikels and Walter L. Crow Feb. 1975 10 p refs
(AF Proj. 7164)
(AD-A007039; SAM-TR-75-6) Avail: NTIS CSCL 06/11

A portable oxygen-contaminant analyzer developed by the USAF School of Aerospace Medicine underwent an extensive 3-month field test and evaluation at 4 participating bases. Oxygen was sampled from aircraft, LOX service carts and bulk storage tanks, and reference samples. The field-test managers unanimously recommended that the analyzer development continue with an operational test and evaluation program. GRA

55 PLANETARY BIOLOGY

Includes exobiology and extraterrestrial life.

N75-23169# San Diego State Coll., Calif. Dept. of Biology.
ORIGIN AND STRUCTURE OF AMERICAN ARID-ZONE ECOSYSTEMS. THE PRODUCERS: INTERACTIONS BETWEEN ENVIRONMENT, FORM, AND FUNCTION
P. C. Miller and H. A. Mooney (Stanford Univ., Calif.) 1974 18 p refs Presented at the 1st Intern. Congr. of Ecol., The Hague, 8 Sep. 1974 Sponsored by ERDA
(Conf-740912-3) Avail: NTIS HC $3.25

The Mediterranean scrub regions of California and Chile occur in a climate with winter rain and summer drought and mild winter temperatures and are comprised predominantly of evergreen sclerophyllous shrubs. Within these regions gradients occur in both countries; the coast is drier than the inland and has a higher frequency of drought deciduous shrubs. California tends to have a greater frequency of narrow, steeply inclined leaves than Chile. The evergreen form occurs where the carbon cost of maintaining leaves through periods of low photosynthesis is lower than the cost of producing new leaves. The deciduous form occurs where the carbon cost of maintaining leaves is higher than the cost of producing new leaves. The shrub form, which is associated with the utilization of deep soil water in the summer, places the photosynthetic tissue above the hot soil surface increasing photosynthesis and water use efficiency. Author (NSA)

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

No abstracts in this category.

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.
For components see *33 Electronics and Electrical Engineering*.

N75-23170 Stanford Univ., Calif.
QUANTIZATION ERROR BOUNDS FOR COMPUTER-GENERATED HOLOGRAMS Ph.D. Thesis
William Abraham Pearlman 1974 254 p
Avail: Univ. Microfilms Order No. 75-6901

The optimal data compression is treated of the discrete-Fourier-transformation (DFT) of a discrete, stationary process for a fixed information rate and a given error criterion. The specific application of the analysis is to an optical holographic memory whose complex-valued point transmittance array is a data compressed or quantized version of a computer-generated DFT of an input data array. The problem is to find an optimal allocation of the given rate among the DFT coefficients and the minimum attainable reconstruction error for all compression schemes with that rate. The solution is initially attacked by establishing a mathematical model for the holographic system, and original statistical models for the real- or complex-valued input data and the DFT processes. Asymptotic normality of the DFT process is proved under generally unrestrictive conditions on the input process. Dissert. Abstr.

N75-23171 Syracuse Univ., N.Y.
CONCURRENT PROCESSING USING DYNAMIC REGISTER ASSIGNMENT AND ASSOCIATIVE TESTING Ph.D. Thesis
Robert Arthur Herman 1974 170 p
Avail: Univ. Microfilms Order No. 75-10546

Design problems encountered in localized concurrent processors include the testing of instructions to determine which ones are independent and can be executed simultaneously and the provision of adequate number of operands so that the instructions can in fact be carried out. A method is presented for mapping and/or assigning registers to instructions in a dynamic fashion and for testing the instructions to prevent procedural dependencies from being executed. A processor is designed which can execute branches and process instruction in different stages of a loop. The techniques developed are combined to form a system which is capable of executing programs in a concurrent fashion without preprocessing. Through use of a simulator it is shown that reduction in running time can be achieved with a limited increase in hardware. Dissert. Abstr.

N75-23172# Defence Scientific Information Service, Ottawa (Ontario). Automated Information Processing Section.
IMPLEMENTATION OF A MINI-COMPUTER BASED INFORMATION SYSTEM. PART 18: A GENERAL FILE DUMP PROGRAM FOR THE VARIAN 620 COMPUTER
G. W. Plunkett Jan. 1975 53 p refs
(DSIS-TM-1/75(DIP)) Avail: NTIS HC $4.25

A convenient, easy-to-use systems program was developed, to aid the operator or programmer in diagnosing programming bugs or machine failures. A multipurpose utility program called the Tape Dump and Utility Monitor (TDUM) program was designed for particular data analysis requirements, but may be used in any installation which has a Varian computer and external storage equipment. The TDUM is written in Varian DAS Assembler language and requires the Varian Master Operating System package. The program performs many diverse functions. The purpose and logic behind the various TDUM routines is examined. Flowcharts and examples of input requests and various types of output dumps are included. Author

N75-23173# Atomic Energy Commission, Washington, D.C.
CAMAC: A MODULAR INSTRUMENTATION SYSTEM FOR DATA HANDLING. SPECIFICATION OF AMPLITUDE ANALOGUE SIGNALS WITHIN A 50 OMEGA SYSTEM
Oct. 1974 13 p
(TID-26614) Avail: NTIS MF $2.25; SOD HC $0.65

The CAMAC was designed for modular equipment systems primarily for line use with digital processors and computers and incorporates a comprehensive data transfer highway. The CAMAC systems. Specific single-ended unipolar and bipolar amplitude analogue signals which are recommended for CAMAC compatible units as used in a 50 Ohm transmission system are discussed. The specifications of the previous version are included and extended. Author (NSA)

N75-23174# Stanford Linear Accelerator Center, Calif.
MAC74, A GENERAL PURPOSE MACRO PROCESSOR
J. C. H. Park Sep. 1974 72 p refs
(Contract AT(04-3)-515)
(SLAC-175) Avail: NTIS HC $4.25

A general purpose macro processor is described that is easy to use, has many versatile features, and is designed to be macroprocessed for easy modifications and extensions. Part 1 shows how the processor is used for various purposes in actual examples of programming. Part 2 is a user's guide and reference containing a detailed description of the processor in this aspect. Author (NSA)

N75-23175# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
POSSIBILITIES FOR THE CONSTRUCTION OF VARIOUS TYPES OF MULTI-VALUE ADDERS FROM MIXERS, SWITCHES, AND SPECTROTRONS
V. V. Maltsev, N. G. Motorev, and V. M. Tuzov 17 Jun. 1974 10 p refs Transl. into ENGLISH from the book "Mnogoustoichivye Elementy i ikh Primenenie. Sborik Statei" USSR, 1971 p 289-295
(AD-781323; FTD-HT-23-1023-74) Avail: NTIS CSCL 09/2

The analysis shows that in using components with frequency coding, adders of very different types can be made which operate both in a position number system and in a system of residual classes. The use of an adder of one type or another is determined by the concrete requirements for the device in which it is used. GRA

N75-23176# Human Engineering Labs., Aberdeen Proving Ground, Md.
DIGIVUE GAS DISPLAY CONTROLLER FOR VARIAN 620 COMPUTERS Final Technical Note
Gordon L. Herald Mar. 1975 19 p
(AD-A007146; HEL-TN-5-75) Avail: NTIS CSCL 09/2

This report describes the design, operation and use of the HEL Digivue gas display unit controller used with Varian 620 computers. A character generator has been included in the controller. The controller permits display programming using the Varian DAS Assembly language. A high-speed, FORTRAN-compatible DAS vector routine has been developed for use with the Digivue controller. GRA

N75-23177# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
ENGINEERING COMPUTER GRAPHICS COLLOQUIM
N. Radhakrishnan, J. B. Cheek, Jr., and D. L. Neumann Jan. 1975 218 p refs Conf. held at Vicksburg, Mass., 8-9 Apr. 1974
(AD-A007251) Avail: NTIS CSCL 09/2

Papers are presented on interactive computer graphics in civil engineering. Topics discussed include computer-aided design, continuous tone computer-generated images in structural mechanics, technology transfer considerations in computer graphics, structural animation computer graphics, engineering data processing, and cathode ray tubes. GRA

N75-23178# Michigan Univ., Ann Arbor. Systems Engineering Lab.
A CONFIGURABLE PARALLEL COMPUTING SYSTEM Interim Report, Jul. 1972 - Oct. 1974
Claudio R. Sonnenburg Feb. 1975 265 p refs
(Contract F30602-73-C-0001; AF Proj. 5581)
(AD-A007008; RADC-TR-74-353) Avail: NTIS CSCL 09/2

This report is concerned with the problem of increasing the speed of computation. A directed graph model of parallel computation with a random access memory is introduced. Unlike previously introduced directed graph models, which were devised primarily as frameworks for the formal study of parallel computation, this model is conceived to be the basis of a viable general purpose machine. It is shown that the model is

computationally complete. In terms of topological characteristics of a graph in the model, sufficient conditions are given for this graph to be determinate. A recursive schema analogous to McCarthy's conditional expresion is defined. A small block oriented high level language is defined, and a translator constructed to translate this language into the directed graph model. A computer architecture is presented in which programs described by the directed graph model can be executed, taking full advantage of the parallelism present in the graph description. GRA

N75-23179# Wayne State Univ., Detroit, Mich. Biomechanics Research Center.
A METHOD FOR RAPID ANALOG TO DIGITAL CONVERSION
Naveen K. Mital and Paul C. Begeman 30 Jun. 1974 16 p
(Contract N00014-69-A-0235-0003; NR Proj. 064-524)
(AD-A006736; TR-2) Avail: NTIS CSCL 09/2

A method has been developed for rapid analog to digital conversion of data using a PDP-8 (Lab 8/E) computer and an industry-compatible digital tape recorder (TM8-EA). The analog data are transducer signals from a sled test event, lasting about 500 msec. Up to 16 channels of these data can be digitized using two 8-channel multiplexers and a 10 bit A/D converter. The frequency content of the signals requires the sampling rate to be at least 2000/sec/channel. By using 2 buffers concept, a maximum conversion rate of 26,000 words/sec can be achieved without loss of data. GRA

N75-23180# Mitre Corp., Bedford, Mass.
SECURE MULTILEVEL VIRTUAL COMPUTER SYSTEMS
R. Rhode Feb. 1975 34 p refs
(Contract F19628-73-C-0001; AF Proj. 572R)
(AD-A007059; MTR-2890; ESD-TR-74-370) Avail: NTIS CSCL 09/2

In order to securely process data at varying levels of sensitivity, the users and data of the various levels are, at present, physically isolated from those at other levels. This paper presents an approach to insuring the isolation of these levels through the use of logical controls present in a virtual computer system (VCS). In addition, possible uses of a secure multilevel VCS are suggested and parallels are drawn with secure computer system development that would aid in the certification of the VCS security controls. GRA

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N75-23181 Stanford Univ., Calif.
FAST ALGORITHMS FOR MULTIVARIABLE SYSTEMS Ph.D. Thesis
Martin Morf 1974 178 p
Avail: Univ. Microfilms Order No. 75-6892

Several efficient algorithms are presented, along with some new approaches, to a variety of important problems in linear multivariable system theory. These include the problems of multivariable systems representation, finding minimal state-space and transfer function realizations from input-output data, fast Cholesky factorizations of covariance matrices and power spectral density matrices and their inverses, and various problems in least squares estimation, control and identification or mathematical modeling. Dissert. Abstr.

N75-23182 Polish Academy of Sciences, Warsaw.
ODRA 1204 COMPUTER PROGRAM FOR COMPUTATION OF POLYNOMIAL ROOTS [PROGRAM NA M. M. ODRA 1204 OBLICZANIA PIERWIASTKOW WIELOMIANOW]
Agnieszka Muszynska 1974 21 p ref In POLISH
Avail: Issuing Activity

The computer program described is based on Bairstow's method for solving polynomial equations. The logic schemes and characteristics of the program are discussed in detail.
Transl. by M.J.S.

N75-23183 Northwestern Univ., Evanston, Ill.
GRAPH-THEORETIC MODELS FOR DIAGNOSIS OF DIGITAL SYSTEM Ph.D. Thesis
Shachindra Nath Maheshwari 1974 78 p
Avail: Univ. Microfilms Order No. 75-7950

Automatic fault diagnosis for digital systems with multiple faults was investigated, along with the concept of probabilistic fault diagnosis. The analysis utilizes the graph-theoretic model; the necessary and sufficient conditons to correctly diagnose any fault set whose probability of occurrence is greater than were developed. Methods for identifying the faults given a set of test outcomes are discussed along with sequential fault diagnosability. Dissert. Abstr.

N75-23184 Illinois Univ., Urbana.
ON HIGH LEVEL DIGITAL SYSTEM DESIGN Ph.D. Thesis
James Byron Peterson 1974 124 p
Avail: Univ. Microfilms Order No. 75-11696

A design system to elevate the level at which complex digital systems are designed was developed. The intent was to raise the level of the representation used to model the system and to raise the level of the primitives onto which the representation is mapped. The top down methodology, designing from the concept toward its implementation in a manner which does not force premature binding of system tradeoff considerations, was investigated to determine its impact on the system of representation. The resulting design language is a higher level language which is a design aid rather than just a descriptive notation. Its unique features include (1) a partial ordering representation of the execution sequence, (2) a complete separation of the control and data structure of the design into node and leaf procedures, and (3) control constructs which make the language a structured programming language for designing digital systems.
Dissert. Abstr.

N75-23185*# Notre Dame Univ., Ind. Dept. of Electrical Engineering.
A RECOMMENDED R EQUALS 1/2, K EQUALS 32, QUICK-LOOK-IN CONVOLUTIONAL CODE FOR NASA USE
James L. Massey 28 Apr. 1975 14 p refs
(Grant NsG-5025)
(NASA-CR-142725; TR-EE-751) Avail: NTIS HC $3.25 CSCL 09B

A new R = 1/2 K = 32 quick-look-in code is described and compared to the R = 1/2 K = 32 Massey-Costello code now used in some NASA systems. The new code, has the optimum distance profile property. This new code is shown, by comparison of Fano sequential decoding performance on a simulated Gaussian noise channel, to be computationally superior to the Massey-Costello code. The new code is also shown to be superior to the Massey-Costello code according to several analytical code criteria. Author

N75-23186# Sandia Labs., Albuquerque, N.Mex.
COINCIDENT COORDINATE METHOD FOR INCREASED EFFICIENCIES IN ACHIEVING MATCH AND FIT OF PARTS
T. P. Conlon Jan. 1975 14 p refs
(Contract AT(29-2)-789)
(SAND-74-0031) Avail: NTIS HC $3.25

The coincident coordinate method (COCOM) was developed to eliminate inefficiencies and inspection of piece parts. An example computer program that illustrates the COCOM approach is presented, and applications of the method are reviewed. Steps for implementing this approach into a total production system are suggested. Author (NSA)

N75-23187# National Physical Lab., Teddington (England). Div. of Numerical Analysis and Computing.
TESTING THE DIAGNOSTIC FEATURES OF THE BABEL COMPILER
R. S. Scowen Sep. 1974 33 p refs
(NPL-NAC-57) Avail: NTIS HC $3.75

The diagnostic features of the Babel compiler were tested by a number of small programs. The results are given together with information on the Eldon operating system and the debugging

and diagnostic features in Babel. A listing and compiler-output of the more interesting tests are also given. ESRO

N75-23188# University of South Florida, Tampa. Dept. of Electrical Engineering.
SUPER-SCEPTRE: USER'S MANUAL. A PROGRAM FOR THE ANALYSIS OF ELECTRICAL, MECHANICAL, LOGIC AND CONTROL SYSTEMS, CHAPTERS 5 AND 6
J. C. Bowers, J. E. OReilly, Jr., and G. A. Shaw 1 Jul. 1974 46 p
(Contracts DAAA21-73-C-0433; DAAA21-73-C-0655)
(AD-787522) Avail: NTIS CSCL 09/5

SUPERSCEPTRE is a preprocessor developed for use in conjunction with The SCEPTRE circuit analysis program. SUPER-SCEPTRE retains the useful features of SCEPTRE and includes a mechanical description analogous to the SCEPTRE circuit description language. This report is a supplement ot the original users manual. GRA

N75-23189# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE FEASIBILITY OF THE SOLUTION OF PROBLEMS IN UNIFORM COMPUTING SYSTEMS
V. G. Khoroshevskii 12 Feb. 1975 27 p refs Transl. into ENGLISH from Vychislitelnye Sistemy (USSR), no. 51, 1972 p 38-47
(AD-A007227; FTD-MT-24-0248-75) Avail: NTIS CSCL 09/2

Problems for stable uniform computing systems are calculated. Emphasis is placed on uniform computing systems consisting of elementary machines and a set of problems, presented by general purpose parallel programs, and the flow of problems, presented by parallel programs. Results are presented. J.M.S.

N75-23190# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
DISTRIBUTED COMPUTATION AND TENEX-RELATED ACTIVITIES Quarterly Progress Report, 1 Nov. 1974 - 31 Jan. 1975
Feb. 1975 39 p
(ARPA Order 2901)
(AD-A006735; BBN-3012; QPR-1) Avail: NTIS CSCL 09/2

During this quarter most of the work in distributed computing was directed toward bringing the TIP login and accounting system into operational status. A TENEX implementation of the Internetwork Transmission Control Program specified by Kahn and Cerf in the May 1974 IEEE Transactions on Communications was completed. This program will support planned Internet experiments between BBN-TENEX, a PDP-11 at Stanford University, and a PDP-9 at University College London. GRA

N75-23191# Naval Research Lab., Washington, D.C.
MICROPROGRAMMED BENCHMARKS FOR THE MICRO-PROGRAMMED CONTROL UNIT OF THE AN/UYK-17 XB-1 V SIGNAL PROCESSING ELEMENT
Honey Sue Elovitz 31 Jan. 1975 154 p refs
(NRL Proj. B02-06; WF21241)
(AD-A006649; NRL-7832) Avail: NTIS CSCL 09/2

The AN/UYK-17(XB-1)(V) Signal Processing Element uses a Microprogrammed Control Unit (MCU) to control the other components of the Signal Processing Element, to format data for these other components, and to perform simple arithmetic calculations. Fourteen benchmark programs were written for an early model of the MCU and run on a simulator. As a result of coding and executing these programs, several changes were made in the MCU and Selector Channel Controller (SCC) designs. GRA

N75-23192# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.
ACCELERATED ITERATIVE METHOD FOR THE SOLUTION OF TRIDIAGONAL SYSTEMS ON PARALLEL COMPUTERS
D. E. Heller, D. K. Stevenson, and J. F. Traub Dec. 1974 38 p refs Sponsored in part by ERDA
(Contract N0014-67-A-0314-0010; Grant NSF GJ-32111; NR Proj. 044-422)
(AD-A006868) Avail: NTIS CSCL 09/2

The authors consider iterative methods for the solution of tridiagonal systems and present a new iteration whose rate of convergence is comparable to that of the optimal two-cyclic Chebyshev iteration but which does not require the calculation of optimal parameters. The theory has a natural extension to block tridiagonal systems. Numerical experiments suggest that on a parallel computer this new algorithm is the best of the iterative algorithms considered. GRA

N75-23193# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.
PARALLEL ALGORITHMS FOR SOLVING TRIANGULAR LINEAR SYSTEMS WITH SMALL PARALLELISM
L. Hyafil (Inst. de Recherche d'Informatique et d'Automatisme) and H. T. Kung Dec. 1974 13 p refs Sponsored in part by Inst. de Recherche d'Informatique et d'Automatisme
(Contract N00014-67-A-0314-0010; Grant NSF GJ-32111; NR Proj. 044-422)
(AD-A006867) Avail: NTIS CSCL 09/2

The problem of solving triangular linear systems of size n on a parallel computer with small parallelism is considered. Assume that the time is measured by the number of parallel steps of any arithmetic operation. It is shown that the problem can be done in time n squared/k <O(n) with k processoors for K < or - O(n), O(n sup (2-r) log n) with O(n sup r) processors for 1< r - 3/2, and O(n sup (1-r/3) (log n) with O(n sup r) processors for 3/2 < or = r < or = 3. The results are obtained by using two principles of reducing parallel algorithms with large parallelism to parallel algorithms with small parallelism. The two principles for the reduction are expected to be useful for other problems. GRA

N75-23194# Stanford Univ., Calif. Dept. of Computer Science.
FOL: A PROOF CHECKER FOR FIRST ORDER LOGIC
Richard W. Weyhrauch and Arthur J. Thomas Sep. 1974 63 p refs
(Contract DAHC15-73-C-0435)
(AD-A006898; SU-STAN-CS-74-432; SU-AIM-235) Avail: NTIS CSCL 09/2

This manual describes the use of the interactive proof checker FOL. FOL implements a version of the system of natural deduction described by Prawitz, augmented in the following ways: (1) it is a many-sorted first-order logic and a partial order over sorts may be declared: this reduces the size of formulas; (2) purely propositional deductions can be made in a single step; (3) the truth values of assertions involving numerical and LISP constants can be derived by computation; (4) there is a limited ability to make metamathematical arguments; and (5) there are many operational conveniences. The goal of FOL is to use formal proof techniques as practical tools for checking proofs in pure mathematics and proofs of the correctness of programs. It is also intended to be used as a research tool in modelling common-sense reasoning in the representation theory of artificial intelligence. GRA

N75-23195# Air Force Flight Test Center, Edwards AFB, Calif.
A TRANSPOSITION ALGORITHM FOR DIGITAL DATA COMPRESSION KEYS Final Report
Fred N. Berra Sep. 1974 22 p refs
(AD-A006789; AFFTC-TD-74-2) Avail: NTIS CSCL 09/2

A key transposition algorithm, a procedure by which computer words are transformed into entities that are used to store and retrieve table information with great efficiency, it useful in many areas of computer information retrieval. A specific key transposition algorithm is presented which applies to a set RN. This set is non-continuous and non-uniform, but has definable subsets (ranging from ki < or equal to k < or equal to kj) which are sequentially uniform. The algorithm operates from densely stored tables and performs most entries to obtain table information with a divide and add operation. A minimum controlled scan is used to retrieve the information only when a transition occurs between one subrange and another. The number of scanned key integers is usually very small. Some timing comparisons with a logarithmic search are presented showing from 30 to 40 percent improvements depending on the digital data comparison key structure defined. GRA

62 COMPUTER SYSTEMS

Includes computer networks.

N75-23196# Pattern Analysis and Recognition Corp., Rome, N.Y.
ADVANCED DIGITAL PROCESSING FOR TARGET CLASSIFICATION. VOLUME 1: INVESTIGATION OF A GENERAL PURPOSE SENSOR PROCESSING SYSTEM Final Report, 1 Jun. - 31 Jul. 1974
John W. Sammon and Edward A. Evans Oct. 1974 60 p refs
(Contract F30602-74-C-0223)
(AD-A002663; RADC-TR-74-253-Vol-1) Avail: NTIS CSCL 09/2

This report summarizes the results of a very brief investigation of the state-of-the-art in microprocessor technology and its applicability to the processing requirements for a range of ground sensor applications. From available devices hardware configurations and logic outlines were suggested for three sensor applications ranging from magnetic/seismic line type to acoustic point devices. Based upon the work one concludes that microprocessors can provide the basis for general purpose sensor processing modules. However, the feasibility of this approach would require a much more detailed study of cost and power considerations as compared to the conventional hardware processing techniques. GRA

N75-23197# Pattern Analysis and Recognition Corp., Rome, N.Y.
ADVANCED DIGITAL PROCESSING FOR TARGET CLASSIFICATION. VOLUME 2: STUDY OF ACOUSTIC SIGNATURES FOR DETECTION OF MOTORIZED ACTIVITY Final Report
Oct. 1974 44 p refs
(Contract F30602-74-C-0223)
(AD-A002667; RADC-TR-74-253-Vol-2) Avail: NTIS CSCL 17/10

This report describes the work performed in the two month period of May 1, 1974 through June 30, 1974, under contract. The task was to investigate the structure of various background noise received at acoustic sensors to determine if algorithms could be developed to distinguish the noise from legitimate target classes, e.g., trucks, APC's, tanks, prop and jet aircraft. The result of this research was the characterization of the various background target classes based on the structure of their power spectrums. The knowledge of the structures permitted the design of a set of features which should be sufficient to seperate non-motorized background from the legitimate target classes. GRA

N75-23198# California Univ., Santa Barbara. Computer Systems Lab.
RESEARCH IN MICRO-TERMINAL DEVELOPMENT AND NETWORK END-TO-END ERROR RECOVERY Technical Quarterly Report, 1 Oct. - 31 Dec. 1974
Roland F. Bryan, John J. McAfee, Paul E. Wells, and William R. Danielson 27 Feb. 1975 14 p
(Contract MDA903-75-G-2; ARPA Order 2852)
(AD-A006589; CSL-48; QTR-1) Avail: NTIS CSCL 09/2

This report discusses the two tasks which are supported by the grant. In Task I, the Computer Systems Laboratory is to seek out the latest developments in miniature display, keyboard, storage, and microprocessors and incorporate these in the implementation of a highly portable computer terminal for individual use. Where devices do not exist to accomplish the task, the Laboratory is to direct and support research in the designated area. The proposed terminal will weigh less than 10 pounds, will have 8,000 words of computer storage and will equal certain minicomputers in performance. A small cassette will be added for auxiliary storage. The report discusses the progress toward realizing this goal. In Task II, CSL is to investigate the requirements necessary for error-free, bi-directional communication between two terminals when the interconnection between terminals may not be under the control of the users themselves. For example when using a packet-switched commercial network. Processors to accomplish this task are being implemented and design specifications are being formulated. GRA

63 CYBERNETICS

Includes feedback and control theory.
For related information see also *54 Man/System Technology and Life Support.*

N75-23199 Stanford Univ., Calif.
RELIABILITY ANALYSIS OF DIGITAL SYSTEMS PROTECTED BY MASSIVE REDUNDANCY Ph.D. Thesis
Jacob A. Abraham 1974 117 p
Avail: Univ. Microfilms Order No. 75-6799

The technique is based on enumerating combinations of faults that are masked by the system. Some of the existing massive redundancy schemes are described, and a brief survey of previous work in redundant system modeling is made. A method of partitioning one kind of massive redundant system, namely a restoring system, into independent subsystems is outlined; this reduces the complexity of reliability evaluation. A new representation of the number of fault patterns that the redundant system can tolerate, the fault matrix, is defined. The system reliability can be easily found from this matrix. Algorithms are given for deriving the fault matrix directly from the topology of various types of systems. The computational complexity of such algorithms is calculated. Bounds to the entries of the fault matrix are given, and it is shown that using the bounds in conjunction with the enumerative technique greatly reduces the complexity of reliability evaluation with only very small errors in the reliability. Dissert. Abstr.

N75-23200 Columbia Univ., New York.
STABILITY PROPERTIES OF PULSE-MODULATED FEEDBACK SYSTEMS Ph.D. Thesis
Ralph Walk 1974 115 p
Avail: Write to author at 18 Alpine Dr., Morristown, N. J. 07960. After 1 Apr. 1976 copies can be obtained from Univ. Microfilms Order No. 75-5265

The stability of pulse-modulated feedback systems is studied. Considering the system as a composition of operators defined on particular function spaces, algebraic and geometric conditions for norm boundedness are derived and applied to examples of engineering interest. The research first investigates properties of the mathematical model, such as existence, uniqueness, and causality of solutions. Stability is then defined, and techniques from functional analysis are used to generate some intuitively appealing criteria. Frequency domain results, similar to the Nyquist criterion and the Popov Theorem, are also derived. Dissert. Abstr.

N75-23201 California Univ., Los Angeles.
A SEMI-GROUP APPROACH TO TIME OPTIMAL BOUNDARY CONTROL OF DIFFUSION PROCESSES Ph.D. Thesis
Donald Charles Washburn 1974 88 p
Avail: Univ. Microfilms Order No. 75-9444

A system governed by the diffusion equation and derive a map from the boundary control function to the state at time t is considered. It is shown that this state is well defined if the kernel of the map satisfies a growth condition and the boundary function is chosen in an appropriate space. A theorem is proved concerning this growth condition and shows, that it is satisfied for a large class of problems. Using this knowledge it is proved that the time optimal control exists and in certain cases can be characterized as the weak star limit of a sequence of bang-bang controls. Dissert. Abstr.

N75-23202 California Univ., Los Angeles.
A TECHNIQUE FOR ASSESSING THE STABILITY OF FREQUENCY MODULATED CONTROL SYSTEMS Ph.D. Thesis
Richard Joseph Olerich 1974 257 p
Avail: Univ. Microfilms Order No. 75-10103

A method is described which may be used to obtain linearized mathematical models for a class of dynamic systems which employ frequency modulation to transfer information between points

within the systems. It is directed specifically toward the development of stability criteria for feedback control systems of this type. An optical tracking system is analyzed in detail, and the results of the analysis are compared with a semi-physical analog computer simulation of the system. Several system parameters were varied, and the corresponding effect on stability was determined. The class of systems to which this method applies contains an element which produces a frequency modulated waveform. At another point in the system, an FM detector was used to demodulate the signal and obtain an estimate of the system state. The effect of the dynamics of the modulation and demodulation processes on system stability is discussed.
Dissert. Abstr.

N75-23203 Cornell Univ., Ithaca, N.Y.
KRONECKER INVARIANTS APPLIED TO THE SERVOMECHANISM PROBLEM Ph.D. Thesis
Cheryl Falkinburg Newman 1975 150 p
Avail: Univ. Microfilms Order No. 75-10451

The problem of creating robust solutions to the multivariable servomechanisms problem is considered by applying the theory of Kronecker invariants. It is shown that if the disturbance to be rejected and the signal to be tracked can be expressed as differential equations, the problem is only to add proper finite divisors to the original system and then to stabilize the altered system. Adding finite divisors is accomplished by dynamic output feedback. Stabilization is accomplished by using part of the dynamic feedback loop and a Luenberger dual observer on the original system. Comparisons are made with other approaches, notably that of Davison. An extension is made as well as suggestion for further research. The appendix contains an APL algorithm to place poles in the compensated system as well as a sample run complete with generated global matrices.
Dissert. Abstr.

N75-23204*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DIGITAL PROGRAM FOR SOLVING THE LINEAR STOCHASTIC OPTIMAL CONTROL AND ESTIMATION PROBLEM
Lucille C. Geyser and Bruce Lehtinen Washington Mar. 1975 167 p refs
(NASA-TN-D-7820; E-8016) Avail: NTIS HC $6.25 CSCL 12A

A computer program is described which solves the linear stochastic optimal control and estimation (LSOCE) problem by using a time-domain formulation. The LSOCE problem is defined as that of designing controls for a linear time-invariant system which is disturbed by white noise in such a way as to minimize a performance index which is quadratic in state and control variables. The LSOCE problem and solution are outlined; brief descriptions are given of the solution algorithms, and complete descriptions of each subroutine, including usage information and digital listings, are provided. A test case is included, as well as information on the IBM 7090-7094 DCS time and storage requirements.
Author

N75-23205# Arizona Univ., Tucson. Dept. of Mathematics.
THE NEARLY SINGULAR LINEAR REGULATOR PROBLEM
Robert E. OMalley, Jr. Jan. 1975 31 p refs Presented at the 3d Mexico-United States Symp. on Differential Equations, Mexico City, Jan. 1975
(Contract N00014-67-A-0209-0022; NR Proj. 041-466)
(AD-A006635; TR-8) Avail: NTIS CSCL 12/1

An asymptotic solution to the linear state regulator problem with cheap control is obtained by using a linear feedback control and asymptotically solving the singularly perturbed equations for the Riccati gain and the resulting trajectories. Such problems arise in a variety of important control contexts. The resulting singular perturbation problems are nontrivial and the resulting boundary layer behavior has significant interpretation for the applications.
GRA

N75-23206# Pattern Analysis and Recognition Corp., Rome, N.Y.
ADVANCED MULTISPECTRAL IMAGE DESCRIPTOR SYSTEM AMIDS Final Technical Report, Jul. 1973 - Jun. 1974
George E. Forsen, John C. Lietz, Donald R. House, Gerald T. Stevens, and Michael J. Gillotte, Jr. Jan. 1975 76 p refs
(Contract F30602-73-C-0371; AF Proj. 6244)
(AD-A007007; PAR-74-17; RADC-TR-74-346-Vol-1) Avail: NTIS HC $4.75 CSCL 09/2

Studies by military and civil agencies indicate that targets of military significance may be automatically classified by digital processing of multi-spectral airborne reconnaissance imagery. The objective of this effort is the development and implementation of expanded preprocessing and analysis techniques which will use multi-channel data to classify image points. The project resulted in the addition, to the dedicated digital image processing system at RADC, of special file handling programs and a comprehensive sub-set of OLPARS (On-Line Pattern Analysis and Recognition System). These routines allow a complete thematic mapping (point recognition) application to be performed in an interactive, efficient manner.
GRA

N75-23207# Perceptronics, Inc., Woodland Hills, Calif.
MAN/MACHINE INTERACTION IN ADAPTIVE COMPUTER-AIDED CONTROL: ANALYSIS OF AUTOMATED CONTROL ALLOCATION Technical Report, 15 Nov. 1973 - 15 Nov. 1974
William H. Crooks, Marlene Artof, Gershon Weltman, and Amos Freedy 30 Dec. 1974 80 p refs
(Contract N00014-72-C-0093; NR Proj. 196-118)
(AD-A006936; PATR-1008-74-12/30) Avail: NTIS HC $4.75 CSCL 05/8

Control allocation between the human operator and an intelligent control element is becoming an important part of advanced Navy systems, which place increasing emphasis on decision making as compared with manual control. The present research focuses on human factors criteria for the man/machine interactions in such shared decision and control systems. The research effort includes evaluations of task allocation methods, information feedback, decision risks, and operator indoctrination. This report presents the results of a series of experimental investigations of adaptive computer-aided control and task allocation.
GRA

N75-23208# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SYNTHESIS OF THE OPTIMUM CONTROL DURING MOTION IN UNIFORM CENTRAL FIELD IN THE CASE OF THE COLLINEARITY OF THE VECTORS OF THE FINAL FAULT ON RADIUS-VECTOR AND VELOCITY VECTOR
G. E. Kuzmak 13 Feb. 1975 46 p Transl. into ENGLISH from Uch. Zap. Tsentr. Aerogidrodinamicheskii Inst. (USSR), v. 2, no. 1, 1971 p 60-72
(AD-A007190; FTD-MT-24-0388-75) Avail: NTIS CSCL 12/1

The transition between the arbitrary intersecting orbits is discussed along with changes in thrust levels. A trajectory of flight passage with two active sections under arbitrary boundary conditions was investigated.
M.J.S.

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N75-23209*# Massachusetts Inst. of Tech., Cambridge. Dept. of Mathematics.
GENERALIZED DU FORT-FRANKEL METHODS FOR PARABOLIC INITIAL BOUNDARY VALUE PROBLEMS
David Gottlieb and Bertil Gustafsson (Uppsala Univ.) [1975] 32 p refs
(Grant NGR 47-102-001)
(NASA-CR-132653) Avail: NTIS HC $3.75 CSCL 12A

The Du Fort-Frankel difference scheme is generalized to difference operators of arbitrary high order accuracy in space and to arbitrary order of the parabolic differential operator. Spectral methods can also be used to approximate the spatial part of the differential operator. The scheme is explicit, and it is unconditionally stable for the initial value problem. Stable boundary conditions are given for two different fourth order accurate space approximations.
Author

N75-23210 Polish Academy of Sciences, Warsaw.
SIMILARITY, INVARIABILITY, SYMMETRY. PART 1: METHODS [PODOBIENSTWO, NIEZMIENNICZOSC, SYMETRIA. CZESC 1: METODA]
Jan Rychlewski 1974 51 p refs In POLISH
Avail: Issuing Activity

The synthesis of symmetric objects was investigated along with the similarity and stability of objects, the structure of stable objects, structure of symmetrical objects, and set theory. Other topics discussed include special structures such as semi-groups, groups, dynamic systems, ergodic theory, linear spaces, tensor spaces and functions, spacial processes, and graphs.
Transl. by M.J.S.

N75-23211*# New York Univ., N.Y. Courant Inst. of Mathematical Sciences.
ALMOST PERIODIC SOLUTIONS TO DIFFERENCE EQUATIONS
Alvin Bayliss May 1975 119 p refs
(Grants NsG-5034; AF-AFOSR-2728-74; ARPA Order 2774)
(NASA-CR-142704; IMM-409) Avail: NTIS HC $5.25 CSCL 12A

The theory of Massera and Schaeffer relating the existence of unique almost periodic solutions of an inhomogeneous linear equation to an exponential dichotomy for the homogeneous equation was completely extended to discretizations by a strongly stable difference scheme. In addition it is shown that the almost periodic sequence solution will converge to the differential equation solution. The preceding theory was applied to a class of exponentially stable partial differential equations to which one can apply the Hille-Yoshida theorem. It is possible to prove the existence of unique almost periodic solutions of the inhomogeneous equation (which can be approximated by almost periodic sequences) which are the solutions to appropriate discretizations. Two methods of discretizations are discussed: the strongly stable scheme and the Lax-Wendroff scheme.
Author

N75-23212# Sandia Labs., Albuquerque, N.Mex.
ROTATIONS AND INVARIANTS OF SECOND-ORDER TENSORS
W. Herrmann Dec. 1974 83 p
(Contract AT(29-1)-789)
(SAND-74-0402) Avail: NTIS HC $4.75

Results useful in connection with tensor calculations commonly encountered in continuum mechanics are presented. Some common properties of symmetric and orthogonal second-order tensors in three dimensions are collected and discussed. The FORTRAN subroutines that perform most common vector and tensor calculations are presented. Author (NSA)

N75-23213# Los Alamos Scientific Lab., N.Mex.
DETERMINATION OF ELLIPSES SATISFYING VARIOUS POINT-SLOPE CONDITIONS
C. J. Everett and W. M. Taylor Dec. 1974 11 p refs
(Contract W-7405-eng-36)
(LA-5816-MS) Avail: NTIS HC $3.25

The ellipse alpha squared(x-x sub O)squared + beta squared (y-y sub O)squared =1 passing through a given set of points, with certain slope conditions is determined. For the '2 point, 2 slope' and '3 point, 1 slope' cases, necessary and sufficient conditions are given for the existence of such an ellipse, and its parameters x sub O, y sub O, alpha squared, beta squared are obtained as rational functions of the prescribed coordinates and slopes. Numerical examples are included. Author (NSA)

N75-23214# Union Carbide Corp., Oak Ridge, Tenn. Nuclear Div.
NUMERICAL SOLUTION TO THE GENERALIZED EIGENVALUE PROBLEM
R. C. Ward Dec. 1974 67 p refs
(Contract W-7405-eng-26)
(UCCND-CSD-7) Avail: NTIS HC $4.25

Most of the popular algorithms for numerically solving the generalized eigenvalue problem are briefly analyzed with special emphasis placed on the QZ algorithm and the combination shift QZ algorithm. The emergence of infinite eigenvalues under exact arithmetic is discussed in detail for both these algorithms. This leads to the presentation of an improved version of the combination shift QZ algorithm. The reduction of eigenvalue problems involving higher powers of lambda to a generalized eigenvalue problem is also discussed. Author (NSA)

N75-23215# National Physical Lab., Teddington (England). Div. of Numerical Analysis and Computing.
ON AN ALGORITHM FOR POLYNOMIAL DEFLATION BY BROYDEN AND FORD
G. Peters and J. H. Wilkinson Sep. 1974 27 p refs
(NPL-NAC-55) Avail: NTIS HC $3.75

A brief resume is given of the algorithm derived by Broyden and Ford for polynomial deflation. An alternative, simpler algorithm, is described and compared. ESRO

N75-23216# Army Research Office, Durham, N.C.
TRANSACTIONS OF THE 19TH CONFERENCE OF ARMY MATHEMATICIANS, PART 1
Dec. 1973 595 p refs Conference held at Orlando, Fla., 23-25 May 1973
(AD-781770; AROD-73-3-Pt-1) Avail: NTIS

Papers given at the meeting are presented along with short abstracts of each. Topics discussed include polytropic representation for very strong shock compression of solids, a theoretical study of damage to thin shells caused by internal blast attack, a general computer program for solving linear-nonlinear regression problems, a new comprehensive 3-point numerical differentiation formula interpolation in the numerical solution of the differential equations of exterior ballistics, magnetic spin correlations of Heisenberg systems with uniaxial and exchange anisotropy by the method of moments, quantized natural collision coordinates method--quantum mechanical canonical point transformations, PPI radar scene simulation, and use of hydrodynamic computer codes in analyzing the effects of shallow buried explosive charges. GRA

N75-23217# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SOLUTION OF THE QUASI-DIAGONAL SYSTEMS OF LINEAR ALGEBRAIC EQUATIONS BY GROUP RELAXATION
V. P. Kolomiets 7 Feb. 1975 41 p refs Transl. into ENGLISH from Uch. Zap. Tsentr. Aerogidrodinamicheskii Inst. (USSR), v. 2, no. 1, 1971 p 92-102
(AD-A007232; FTD-MT-24-0391-75) Avail: NTIS CSCL 12/1

The characteristics of group relaxation methods are discussed along with the shuttle principle of iteration which is proposed for increasing the rate of convergence of iterative processes. Other topics discussed include stress analysis, matrix methods, wave propagation, perturbation theory, vector analysis, and problem solving. M.J.S.

N75-23218# Harvard Univ., Cambridge, Mass. Center for Research in Computing Technology.
ALGORITHMIC ASPECTS OF VERTEX ELIMINATION ON GRAPHS
Donald J. Rose and R. Endre Tarjan (California Univ., Berkeley) 10 Mar. 1975 38 p refs
(Contract N00014-67-A-0298-0034; Grant NSF GJ-35604X; NR Proj. 044-454)
(AD-A006926) Avail: NTIS CSCL 12/1

A graph-theoretic elimination process is considered which is related to performing Gaussian elimination on sparse symmetric positive definite systems of linear equations. A new linear-time algorithm is given to calculate the fill-in produced by any elimination ordering, and two new related algorithms are given for finding orderings with special properties. One algorithm, based on breadth-first search, finds a perfect elimination ordering, if any exists, in O(n-e) time, if the problem graph has n vertices and e edges. An extension of this algorithm finds a minimal (but not necessarily minimum) ordering in O(ne) time. The authors conjecture that the problem of finding a minimum ordering is NP-complete. GRA

N75-23219# Indiana Univ., Bloomington. Dept. of Mathematics.
INTEGRAL OPERATORS FOR FOURTH ORDER LINEAR PARABOLIC EQUATIONS Interim Report

Patrick M. Brown 1974 45 p refs Prepared in cooperation with Gonzaga Univ.
(Contracts AF-AFOSR-2592-74; AF-AFOSR-2205-71; AF Proj. 9749)
(AD-A006919; AFOSR-75-0337TR) Avail: NTIS CSCL 12/1

Integral operators in the sense of S. Bergman and I. N. Vekua have been used extensively to represent and study analytic solutions of elliptic partial differential equations. The corresponding tool for parabolic equations would map analytic functions of two variables onto analytic solutions and would be valuable for investigating the analytic behavior of these solutions. In this paper a Colton-Bergman operator is constructed which maps analytic functions of two variables to solutions of a fourth order parabolic equation in two space variables. GRA

N75-23220# Indiana Univ., Bloomington. Dept. of Mathematics.
A FUNCTION THEORETIC APPROACH TO HIGHER ORDER PSEUDOPARABOLIC EQUATIONS
S. C. Bhatnagar and R. Pertsch Gilbert 10 Dec. 1974 24 p refs
(Grant AF-AFOSR-2592-74; AF Proj. 9749)
(AD-A006755; AFOSR-75-0332TR) Avail: NTIS CSCL 12/1

Bhatnagar and Gilbert developed an analytic theory for pseudoparabolic equations in three space variables. In this paper the authors continue this approach for this class of equations in four space variables. The authors remark, however, these techniques are only limited up to four space variables. This follows from a theorem due the Kukral who proved that a Bergman-type auxillary variable does not exist for Laplace's equation in more than four variables. GRA

N75-23221# Indiana Univ., Bloomington. Dept. of Mathematics.
GENERALIZED REFLECTION PRINCIPLES FOR PARABOLIC EQUATIONS IN ONE SPACE VARIABLE
David Colton 1974 17 p refs
(Grant AF-AFOSR-2592-74; AF Proj. 9749)
(AD-A006811; AFOSR-75-0334TR) Avail: NTIS CSCL 12/1

Reflection principles are obtained for parabolic equations satisfying the boundary conditions. The approach taken to the reflection problem is based on the construction of an integral operator which maps solutions of the heat equation on to solutions of parabolic equations with variable coefficients. The reflection principle obtained is valid for strong solutions of parabolic equations. It is shown that for analytic solutions of parabolic equations in one space variable with analytic coefficients reflection principles are trivial in the same sense that any analytic solution of a parabolic equation in one space variable can be analytically continued into a strip bounded by the characteristics, regardless of what the analytic date is on the t axis. Author

N75-23222# Harvard Univ., Cambridge, Mass. Center for Research in Computing Technology.
ALGORITHMIC ASPECTS OF VERTEX ELIMINATION
Donald J. Rose and R. Endre Tarjan Mar. 1975 26 p refs Presented at SIGACT 75, Albuquerque, N.M., May 1975 Prepared in cooperation with Calif. Univ., Berkeley
(Contract N00014-67-A-0298-0034; Grant NSF GJ-35604X)
(AD-A006753) Avail: NTIS CSCL 12/1

A graph-theoretic elimination process is considered which is related to performing Gaussing elimination on sparse symmetric and unsymmetric systems of linear equations. Algorithms are discussed for finding elimination orderings, using a lexicographic search, if the problem graph is undirected. Algorithms are also given for generating such orderings on directed graphs. The relation of elimination to transitive closure is discussed. GRA

N75-23223# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.
SOME ASPECTS OF THE CYCLIC REDUCTION ALGORITHM FOR BLOCK TRIDIAGONAL LINEAR SYSTEMS Interim Report
Don Heller Oct. 1975 27 p refs
(Contract N00014-67-A-0314-0010; NR Proj. 044-422)
(AD-A006865) Avail: NTIS CSCL 12/1

The solution of a general block tridiagonal linear system by a cyclic odd-even reduction algorithm is considered. Under conditions of diagonal dominance, norms describing the off-diagonal blocks relative to the diagonal blocks decrease quadratically with each reduction. This allows early termination of the reduction when an approximate solution is desired. The algorithm is well-suited for parallel computation. GRA

N75-23224# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.
NUMERICAL STABILITY FOR SOLVING NONLINEAR EQUATIONS
H. Wozniakowski Feb. 1975 23 p refs
(Contract N00014-67-A-0314-0010; Grant NSF GJ-32111; NR Proj. 044-422)
(AD-A006862) Avail: NTIS CSCL 12/1

The concepts of the condition number, numerical stability and well-behavior for solving systems of nonlinear equations $F(X) = 0$ are introduced. Necessary and sufficient conditions for numerical stability and well-behavior of a stationary iteration are given. The author proves numerical stability and well-behavior of the Newton iteration for solving systems of equations and of some variants of secant iteration for solving a single equation under a natural assumption on the computed evaluation of F. Furthermore it is shown that the Steffensen iteration is unstable and it is shown how to modify it to have well-behavior and hence stability. GRA

N75-23225# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.
NUMERICAL STABILITY OF THE CHEBYSHEV METHOD FOR THE SOLUTION OF LARGE LINEAR SYSTEMS
H. Wozniakowski Mar. 1975 21 p refs
(Contract N00014-67-A-0314-0010; Grant NSF GJ-32111; NR Proj. 044-422)
(AD-A006863) Avail: NTIS CSCL 12/1

The rounding error analysis is reported for the Chebyshev method for the solution of large linear systems $Ax+g = 0$ where $A = A^*$ is positive definite. The Chebyshev method in floating point arithmetic is numerically stable, which means that the computed sequence approximates the solution alpha. The Chebyshev method is not well-behaved, which means that it is not the exact solution for a slightly perturbed A. Author

N75-23226# Indiana Univ., Bloomington. Dept. of Mathematics.
ANALYTIC, GENERALIZED, HYPERANALYTIC FUNCTION THEORY AND AN APPLICATION TO ELASTICITY
Robert P. Gilbert and Wolfgang L. Wendland 10 Dec. 1974 31 p refs
(Contract AF-AFOSR-2592-74; AF Proj. 9749)
(AD-A006819; AFOSR-75-0333TR) Avail: NTIS CSCL 12/1

This paper is concerned with function theoretic methods for elliptic systems of first order, linear equation in two independent variables. GRA

N75-23227# Indiana Univ., Bloomington. Dept. of Mathematics.
BERGMAN TYPE OPERATORS FOR PSEDOPARABOLIC EQUATIONS IN SEVERAL SPACE VARIABLES
S. C. Bhatnagar and R. Pertsch Gilbert 10 Dec. 1974 25 p refs
(Contract AF-AFOSR-2592-74; AF Proj. 9749)
(AD-A006752; AFOSR-75-0331TR) Avail: NTIS CSCL 12/1

The techniques of function theoretic methods are utilized to construct integral operators which generate solutions for pseudoparabolic equations in several space variables. Author

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N75-23228 Kansas Univ., Lawrence.
A CLASS OF STOCHASTIC MODELS FOR POROUS MEDIA Ph.D. Thesis
Madhusudan Y. Joshi 1974 163 p
Avail: Univ. Microfilms Order No. 75-6207

A new approach was developed for porous media modeling which consists in treating the microscopic pore-solid structure as a realization of a stationary stochastic process. The porous medium so defined is a set of random variables characterized by a probability distribution and autocorrelation function. An algorithm was developed to generate a two dimensional set of random numbers having any desired probability distribution and autocorrelation function. This set of numbers simulates the optical transmission (graytone scale) of photomicrographic sections of reservoir rock. The algorithm is based on suitable linear and nonlinear operations to transform the output of a Gaussian random number generator into a set with desired attributes. Photographic simulations of porous media microstructure are made for several types of autocorrelation and probability distribution functions. A random walk model is proposed to determine tortuosities of reservoir rock samples from microscopic thin sections. Dissert. Abstr.

N75-23229*# California Univ., Berkeley.
N-PLAYER STOCHASTIC DIFFERENTIAL GAMES
Pravin Varaiya 26 Nov. 1974 16 p refs Prepared in cooperation with MIT, Cambridge, Mass.
(Grant NGL-22-009-124; Contract F44260-71-C-0087; Grant AF-AFOSR-2273-72)
(NASA-CR-142674; ESL-P-578) Avail: NTIS HC $3.25 CSCL 12A

Conditions are presented which guarantee that the control strategies adopted by N players constitute an efficient solution, an equilibrium, or a core solution. The system dynamics are described by an Ito equation, and all players have perfect information. When the set of instantaneous joint costs and velocity vectors is convex the conditions are necessary. Author

N75-23230# North Carolina Univ., Chapel Hill. Dept. of Statistics.
WEAK CONVERGENCE OF HIGH LEVEL EXCEEDANCES BY A STATIONARY SEQUENCE
M. R. Leadbetter Jun. 1974 12 p refs
(Contract N00014-67-A-0321-0002; NR Proj. 042-214)
(AD-781728; Mimeo-Ser-933) Avail: NTIS CSCL 12/1

A stationary sequence satisfying weak dependence restrictions is discussed. It is shown that the point processes N sub n converge weakly (as random elements of the natural metric space to which they belong) to a Poisson process. Author (GRA)

N75-23231# Rocketdyne, Canoga Park, Calif.
BAYESIAN SAMPLING Final Report, 1 Jun. 1973 - 31 Dec. 1974
N. R. Mann and K. W. Fertig 28 Feb. 1975 8 p refs
(Contract N00014-73-C-0474; NR Proj. 042-321)
(AD-A006592; R-9670-F) Avail: NTIS CSCL 12/1

A prediction-interval approach was derived for determining Gaussian sampling plans for finite lots required to be of very high quality. The plans are such that a lot is rejected if a single defective item is found in the sample. No loss function is required for the implementation of the plans, so they may be used in any situation in which the manufacturing process is Gaussian and lots are small (less than 100 items) and required to be of high quality. The savings in sample size over traditional attribute plans or variables plans assuming an infinite lot size is considerable. GRA

N75-23232# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
RESTORATION OF THE DISTRIBUTION OF DURABILITY ACCORDING TO THE INCOMPLETE DISTRIBUTION WITH KNOWN CHARACTERISTICS
V. L. Raykher 24 Jan. 1975 28 p Transl. into ENGLISH from Tsentr. Aerogidrodinam. Inst., Uch. Zap. (USSR), v. 2, no. 4, 1971 p 84-89
(AD-A007184; FTD-MT-24-466-75) Avail: NTIS CSCL 12/1

The concept of incomplete distribution of life, defined as the random number distribution, is introduced. Relationships are obtained which make it possible to restore/reduce the distribution function of life F (X) = P (D<X) according to the known characteristics of the incomplete distribution. Author

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N75-23233 Wisconsin Univ., Madison.
THE DESIGN AND IMPLEMENTATION OF A DATA CONVERSION LANGUAGE FOR NETWORKS Ph.D. Thesis
Gary Michael Schneider 1974 315 p
Avail: Univ. Microfilms Order No. 74-30126

A special purpose, high-level language, is proposed as a possible solution to the problem of information sharing between incompatible systems in a computer network. These incompatibilities can be either physical, logical, or organization in nature: physical incompatibilities refer to differences in the means of internally storing binary digits (word record, block sizes); logical incompatibilities refer to differences in the methods of internally representing itself (code set, negative number representation); and organizational incompatibilities refer to differences in the way that individual fields within a record, and records within a file, are isolated and retrieved. The language allows a user to view information as an unbounded binary-bit stream without a priori boundaries or predetermined meaning. Dissert. Abstr.

N75-23234 Michigan Univ., Ann Arbor.
ON-LINE DIAGNOSIS OF SEQUENTIAL SYSTEMS Ph.D. Thesis
Robert Joseph Sundstrom 1974 184 p
Avail: Univ. Microfilms Order No. 75-10311

A formal model is presented which can serve as the basis for a theoretical investigation of on-line diagnosis. A notion of on-line diagnosis is formulated which involves an external detector and a maximum time delay within which every error caused by a fault in a prescribed set must be detected. The diagnosis was investigated of two important sets of faults: the set of unrestricted faults and the set of unrestricted component faults. The set of unrestricted faults of a system is defined to be simply the set of all possible faults of that system. It is shown that if a system is on-line diagnosable for the unrestricted set of faults then the detector is at least as complex, in terms of state set size, as the specification. The on-line diagnosis of systems which are structurally decomposed and represented as a network of smaller systems was also investigated. The fault set considered here is the set of unrestricted component faults. Dissert. Abstr.

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N75-23235 Georgia Inst. of Tech., Atlanta.
PARALLEL AND SEQUENTIAL OPERATIONS WITH ARRAY PROCESSORS Ph.D. Thesis
Frank Tsui 1974 143 p
Avail: Univ. Microfilms Order No. 75-1090

The traditional tessellation structure (or array processors) is expanded in two ways. First, nonuniformity is introduced. This additional capability provides us with a more versatile machine. Second, the global transformations in the tessellation structure are extended to include those which result from local transformations applied to the cells in a sequential, parallel-sequential, or sequential-parallel manner. This second extension of the traditional tessellation structure is called a mixed-mode tessellation structure. It is in this generalized setting that various conditions of parallel and sequential processing are considered. As the local transformations in the tessellation structure are similar to some of the operations used in picture processing, the results obtained in the tessellation structure are shown to be applicable to this area. Finally, the results from the tessellation structures are extended to the one-dimensional formal grammars, and the theorems derived in the former are shown to have associated counterparts in the latter. Dissert. Abstr.

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N75-23236 Polish Academy of Sciences, Warsaw.
REGIONS OF ATTRACTION OF NONLINEAR, NEAR-PERIODIC RESONANCES [OBSZARY PRZYCIAGANIA NIELINIOWYCH REZONANSOW PRAWIE-PERIODYCZNYCH]
Wanda Szemplinska-Stupnicka and J. Bajkowski 1974 77 p refs In POLISH
Avail: Issuing Activity

The effective determination was investigated of regions of attraction of near-periodic resonances in a vibrating system with two degrees of freedom. Other topics discussed include steady and unsteady states, nonlinear vibrating systems, the Ritz averaging method, Duffing differential equation, analog computers, and computer techniques. Transl. by M.J.S.

N75-23237 Florida State Univ., Tallahassee.
INDUCED MOMENT ANTIFERROMAGNET IN AN EXTERNAL MAGNETIC FIELD Ph.D. Thesis
Bappanadu Namadev Rao 1974 142 p
Avail: Univ. Microfilms Order No. 75-8054

An induced moment antiferromagnet with a singlet ground state and singlet excited state is investigated in the presence of an external magnetic field. Magnetizations, specific heat and susceptibility were obtained in the molecular field approximation. For the crystal-field interaction comparable to the exchange interaction a substantial reduction in the sublattice magnetizations and in the transition temperature is observed. The net magnetization is found to be finite even at zero temperature in the presence of an external magnetic field. The effect of next nearest neighbor ferromagnetic intrasublattice coupling is also studied. Phase boundaries, critical fields and critical temperatures are obtained using Landau's theory of second order phase transition in conjunction with a detailed examination of the free energy.
Dissert. Abstr.

N75-23238# Materials Research Labs., Maribyrnong (Australia).
THE DETERMINATION OF COLORIMETRIC VALUES OF COLOURS TO BS 381C
R. J. Hancox and L. A. Hill Dec. 1974 40 p refs
(Rept-620) Avail: NTIS HC $3.75

The spectrophotometric curves of five sets of BS 381C colors were determined and the colorimetric values calculated. Indications of the degree of color difference to be expected between different sets of new cards and between new and old sets of cards are given. In addition those colors most likely to cause problems are indicated. It is now possible to assess BS 381C color cards instrumentally in Australia for suitability to purpose. Author

N75-23239# Comitato Nazionale per l'Energia Nucleare, Frascati (Italy). Lab. Nazionali di Frascati.
CALCULATION OF THE FORCE EXERCISED ON AN ALUMINUM PLATE MOVING UNIFORMLY IN A TRAVELING MAGNETIC FIELD MOVING SINUSOIDALLY IN THE DIRECTION OF MOTION
F. G. Moscati, G. Sacerdoti, and M. G. Veca 6 May 1974 31 p In ITALIAN
(LNF-74/20(r)) Avail: ERDA Depository Libraries HC $4.75

In a study on magnetic suspensions for bodies in motion, the forces acting on a conducting support in uniform motion along the x axis and immersed in a traveling magnetic field moving sinusoidally in the direction of motion were calculated for the two-dimensional case. The pulling force, the maintenance force and the power dissipated by Joule effect in the moving plate are determined for various values of the parameters characterizing the structure, both geometric and electric. The numerical results are tabulated. NSA

N75-23240# Brookhaven National Lab., Upton, N.Y.
SPIN WAVES IN AN AMORPHOUS METALLIC FERROMAGNET
J. D. Axe, L. Passell, and C. C. Tsuei (IBM Watson Res. Center) 1974 7 p refs Presented at the 20th Ann. Conf. on Magnetism and Magnetic Mater., San Francisco, 3 Dec. 1974 Sponsored by ERDA
(BNL-19412; Conf-741202-11) HC $3.25

Low angle inelastic neutron scattering experiments were carried out on the amorphous ferromagnet FE75P15C10, with a Curie temperature Tc = 597 K. At reduced temperatures, t = T/Tc, between 0.5 and 0.83 well defined spin waves were observed with propagation vectors q = 2 sq/lambda smaller than 0.18 sq/1 with a ferromagnetic dispersion relation = D(T) q squared + E(T)q to the 4th power. Inability to close the scattering triangle rather than intrinsic broadening prevents extension of the measurements to even shorter wavelengths.
Author (NSA)

71 ACOUSTICS

Includes sound generation, transmission and attenuation.

For noise pollution see *45 Environment Pollution*.

N75-23241 Carnegie-Mellon Univ., Pittsburgh, Pa.
INVESTIGATION OF THE SOUND TRANSMISSION CHARACTERISTICS OF SANDWICH PANELS Ph.D. Thesis
Mark Alan Lang 1975 103 p
Avail: Univ. Microfilms Order No. 75-5526

An analysis of the transmission of sound through sandwich panels (consisting of lightweight, flexible cores between relatively stiff skins) is presented. Previously given results for the free vibrations of such panels are analyzed and unified. Then a travelling-wave analysis is used to obtain impedances and transmission loss formulae. The comparison is relatively good, and confirmation of a symmetric coincidence effect is obtained. The numerical results indicate that this symmetric coincidence generally occurs at a much lower frequency then does antisymmetric (shear wave) coincidence. An optimization study is also presented to investigate the feasibility of an optimal design process for sandwich panels. Using a pattern search procedure, it is shown that the average transmission loss of a panel may be improved through optimization over a range of frequency.
Dissert. Abstr.

N75-23242 Kansas Univ., Lawrence.
COMPUTATIONAL METHODS FOR ANALYZING NONUNIFORM ACOUSTIC WAVEGUIDES Ph.D. Thesis
Roy Joseph Beckemeyer 1974 168 p
Avail: Univ. Microfilms Order No. 75-6153

Computational techniques are used to model the transmission of discrete frequency sound in a duct without mean flow, but with a nonuniformity consisting of an axial variation in wall admittance or cross-sectional area. Attention is focused on a variational method which involves the Ritz minimization of functionals which have the equations which govern sound propagation in the nonuniform section of the duct as stationary conditions. Accuracy of the variational approach is verified by application of the method to duct segments of special geometry, for which eigenfunction expansion techniques offer alternative solution procedures. Comparisons are also made with the results of stepped duct approximations to the nonuniformities.
Dissert. Abstr.

N75-23243 Polish Academy of Sciences, Warsaw.
ULTRASONIC INVESTIGATIONS OF POLYPROPYLENE ORIENTATION ACCORDING TO INJECTION SHAPING [ULTRADZWIEKOWE BADANIA ORIENTACJI POLIPROPYLENU PO FORMOWANIU WTRYSKOWYM]
Krzysztof A. Kunert, Halina Zielenkiewicz, and Bernard Kusmider 1974 14 p refs In POLISH
Avail: Issuing activity

The velocity of ultrasonic wave propagation in probes of oriented and nonoriented polypropylene was measured along with the weakening of ultrasonic waves in other probes. Other topics discussed include vibration damping, particle motion, polymer chemistry, and temperature effects. Transl. by M.J.S.

N75-23244 Brown Univ., Providence, R.I.
OPTOACOUSTIC INTERACTIONS IN FLUIDS Ph.D. Thesis
Richard Steven Larson 1974 95 p
Avail: Univ. Microfilms Order No. 75-9196

Two applications of the optoacoustic effect in fluids were developed: the generation of sound due to the inhomogeneous heating from an intensity modulated laser beam, and the scattering of light by a sound wave via perturbations in the dielectric constant of a medium due to the sound wave. The absorption of energy from a modulated laser beam produces a nonuniform heating, and the resultant expansions and contractions of a medium produce a sound wave at the laser modulation frequency. The modulated laser beam forms a thermoacoustic array and produces a highly directional acoustic wave propagating perpendicular to the axis of the laser beam if the attenuation length of the laser intensity is much larger than the wavelength of the generated sound. The array becomes less directional and the pressure amplitude is lower when the laser beam is divergent. Application of thermoacoustic arrays to biomedical diagnostics, underwater communications, and remote sensing of pollutants are discussed. Dissert. Abstr.

N75-23245*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
ULTRASONIC DISPLACEMENT SYSTEM
Nettie D. Faulcon 21 Apr. 1975 15 p refs
(NASA-TM-X-72687) Avail: NTIS HC $3.25 CSCL 20A

An acoustic instrument system is described as a feasible tool for remote measurement of structural velocities. The system involves measurement of the Doppler shift of ultrasonic sound as it is reflected from an oscillating plate. Measurements were performed in air with an ultrasonic frequency source of 42.5 kilohertz. The surface under investigation was a plexiglass plate oscillating sinusoidally at 10, 13, and 15 Hz. Data are presented to show that, in such a system, the measurement of the Doppler shift is dependent upon the acoustic pathlength between the sensing device and the oscillating surface, with the distance between maximum shifts being half the wavelength of the ultrasonic source. Author

N75-23246*# Pennsylvania State Univ., University Park.
PROPAGATION OF SOUND AT MODERATE AND HIGH INTENSITIES IN ABSORBENT AND HARD WALLED CYLINDRICAL DUCTS Ph.D. Thesis
Oliver Herbert McDaniel Mar. 1975 177 p refs Sponsored in part by NSF and Naval Ordnance Systems Command
(Grant NGL-39-009-121)
(NASA-CR-132650) Avail: NTIS HC $7.00 CSCL 20A

The propagation of plane wave and higher order acoustic modes in both hard-walled and absorbent cylindrical ducts was studied at moderate sound intensities where the linear wave equation is valid, and at high intensities where nonlinear effects can be observed. The experiments were conducted with an anechoically terminated twelve-inch inside-diameter transite pipe. Various types of sound sources were mounted at one end of the duct to generate the desired acoustic fields within the duct. Arrays of conventional loudspeakers were used to generate plane waves and higher order acoustic modes at moderate intensities, and an array of four high intensity electro-pneumatic sound sources was used for the experiments in the nonlinear region. The attenuation of absorbent liners made of several different materials was obtained at moderate intensities for both plane waves and high order modes. It was found that the characteristics of the liners studied did not change appreciably at high intensities. Author

N75-23247*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SPINNING MODE SOUND PROPAGATION IN DUCTS WITH ACOUSTIC TREATMENT
Edward J. Rice Washington May 1975 32 p refs
(NASA-TN-D-7913; E-8140) Avail: NTIS HC $3.75 CSCL 20A

Recent acoustic data show larger noise attenuations than predicted for acoustically treated aircraft engine inlets without splitter rings. A theoretical study of the acoustic propagation of spinning modes in acoustically treated open circular ducts is presented, and a suppressor with splitter rings was modeled by using the rectangular approximation to the annular duct. Theoretical models were used to determine optimum impedance and maximum attenuation for several spinning lobe numbers from 0 to 50. Results of the analysis indicate that for circular ducts the maximum possible attenuation and the optimum wall impedance are strong functions of the lobe number, and for annular ducts the attenuation and optimum wall impedance are insensitive to the spinning lobe number for well cut-on modes. These results explain why suppressors with splitter rings were quite effective in spite of the lack of detailed information on the noise source modal structure. Conversely, effective use of outer wall treatment alone will require expanded knowledge of the noise source structure. Approximate solutions are presented to help interpret the more exact theoretical results. Author

N75-23248*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
ULTRASONIC COUPLING TO OPTICALLY GENERATED CHARGE CARRIERS IN CdS: PHYSICAL PHENOMENA AND APPLICATIONS Ph.D. Thesis - Washington Univ., Saint Louis, Mo.
Joseph Saul Heyman May 1975 152 p refs
(NASA-TM-X-68732) Avail: NTIS HC $6.25 CSCL 20A

Phonon-charge carrier interactions are studied as well as ultrasonic resonators. Sensitivity enhancement factors predicted by one dimensional resonator theory are verified and several sensitive ultrasonic experimental techniques are developed. Measurements are reported of an anomalous sign reversal of the acoustoelectric voltage in a CdS resonator. Applications of CdS as an ultrasonic power detector are described. Author

N75-23249# Tokyo Univ. (Japan).
DETECTION OF ECHO BY LINEAR PREDICTION
Hidefumi Kobatake Jan. 1975 14 p refs Repr. from Inst. of Space and Aeron. Sci., Univ. of Tokyo Rept. No. 522, Jan. 1975 p 29-38
(ISAS-522-Vol-40-No-2) Avail: NTIS HC $3.25

A method of echo detection is proposed which is based on the principle that an echo appears as a delta function in the impulse response function of the optimum predictor for the signal containing the echo. The delta function showing the existence of the echo is scarcely overlooked because of its sharpness and easily detectable even if the band width of the time series is not wide enough and if the delay time of the echo is small. Experiments of sound propagation and flexural wave propagation show the effectiveness of this method. Comparison between this method and correlation method is also shown. Author

N75-23250# Texas Univ., Austin. Applied Research Labs.
HIGH-INTENSITY SOUND RESEARCH Interim Scientific Report, 1 Nov. 1973 - 31 Oct. 1974
David T. Blackstock Oct. 1974 10 p refs
(Contract F44620-71-C-0015; AF Proj. 9781)
(AD-A006751; AFOSR-74-0263TR) Avail: NTIS CSCL 20/1

Research carried out during the present contract year, ending 31 Oct. 1974, is on diffraction of an N wave by a circular aperture, improved microphone design, propagation of a spherical N wave in a dissipative medium, visualization of the acoustic field of an N wave, parametric array in air, absorption of sound by sound, and propagation of intense noise in open media. The research has been reported by means of two orally presented papers, one thesis also issued as a technical report, one article in a conference proceedings, and one manuscript submitted for publication in a scientific journal. GRA

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N75-23251*# Nebraska Univ., Lincoln. Behlen Lab. of Physics.
THE P-2 SUB 3/2: P-2 SUB 1/2 PARTIAL PHOTOIONIZATION CROSS SECTION IN THE RARE GASES
James A. R. Samson, J. L. Gardner, and A. F. Starace [1975]

21 p refs
(Grant NGR-28-004-021)
(NASA-CR-142730) Avail: NTIS $3.25 CSCL 20H

The P-2 sub 3/2: P-2 sub 1/2 partial photoionization cross section ratios were measured for the rare gases in the ionization continuum and within resonance structure. The wavelength range for this study was from the P-2 sub 1/2 ionization threshold to 304 A. The ratio of the cross sections was found to be constant over this wavelength range yielding ratios of 1.54, 1.77, 1.93, and 2.18 for Xe, Kr, Ar, and Ne, respectively. Within resonances the ratios changed dramatically. Results are illustrated for xenon. Author

N75-23252# Pisa Univ. (Italy).
THE DETECTION OF NEUTRONS BY THE REACTION (n, ALPHA) ON B10 [LA RIVELAZIONE DEI NEUTRONI MEDIANTE LA REAZIONE (n, ALPHA) SUL B10]
G. Curzio 1974 32 p In ITALIAN
(RP-176(74)) Avail: NTIS HC $3.75

Proportional B10F3 counters are discussed including the reaction (n, alpha) on B10, ionization chambers with B10, and scintillation detectors with B10. Transl by F.O.S.

N75-23253# Sandia Labs., Albuquerque, N.Mex.
K-SHELL FLUORESCENCE YIELD OF IONIZED ALUMINUM
E. J. McGuire Dec. 1974 15 p refs
(Contract AT(29-1)-789)
(SAND-74-0324) Avail: NTIS HC $3.25

Auger and radiative transition rates are calculated for multiplets formed by adding an s vacancy to a partially filled p shell. These expressions are used to calculate the fluorescence yield for multiplet terms in Al ions. The fluorescence yields can differ by an order of magnitude for different terms of a multiplet. However, in averaging over multiplet terms, it is found that the ion fluorescence yield varies by at most a factor of two from its value in neutral Al. Author (NSA)

N75-23254# Tennessee Univ., Knoxville.
ELECTRON ATTACHAMENT TO MOLECULES IN VERY HIGH PRESSURE GASES Ph.D. Thesis
R. E. Goans Jun. 1974 130 p refs Sponsored by ERDA
(TID-26694) Avail: NTIS HC $5.75

Electron capture mechanisms and reaction schemes were developed for electron attachment to O2, C6H6, and C2H5Br embedded in high densities of N2, Ar, C2H4, and C2H6 media. As the density of each medium increases, each is found to affect the attachment rate in a different manner, indicating the profound effect and importance of the environment on the electron attachment process. The capture of slow electrons by O2 in high pressure of N2, C2H4, and C2H6 media is discussed along with that of Benzene and Bromoethane in high pressures of N2 and Ar media. Models are presented to account for the experimental observations in each case. A reaction mechanism is presented which accounts for the relative magnitudes of the rate constants for autoionization, dissociation, and collisional stabilization. The high pessure data for electron attachment to O2, C6H6, and C2H5Br to form the respective negative ions were extrapolated to liquid densities to yield values of the attachment rate in the liquid state. Author (NSA)

N75-23255# Georgia Inst. of Tech., Atlanta. School of Physics.
FORMATION OF EXCITED HYDROGEN AND HELIUM BY H POSITIVE AND He POSITIVE IMPACT ON METAL SURFACES
E. W. Thomas 1974 8 p Presented at the Am. Phys. Soc. Meeting, Atlanta, Georgia, 5 Dec. 1974 Sponsored by ERDA
(ORO-2591-74; Conf-741209-2) Avail: NTIS HC $3.25

Helium and hydrogen impact on aluminum, copper, nickel, and molybdenum at 20 to 30 keV is studied regarding line shapes and line intensities. NSA

N75-23256# Office National d'Etudes et de Recherches Aerospatiales, Toulouse (France). Dept. d'Etudes et de Recherches en Technologie Spatiale.
CATHODOLUMINESCENCE OF THE MAGNESIUM FLUORIDE [CATHODOLUMINESCENCE DU FLUORURE DE MAGNESIUM]
M. Romero Oct. 1974 77 p refs In FRENCH
(ONERA-DERTS-NT-02-37) Avail: NTIS HC $4.75

The cathodoluminescence of MgF2 at low temperature was investigated and shown to depend on temperature. The luminous intensity of the emission band, about 1000 Angstrom wide, centerline around 4000 Angstrom, is stable below 65 K decreases by a factor 40 until 100 K, and is nonexistent for temperatures higher than 125 K. The emission centerline also varies in position with temperature. An anticorrelation was found between luminescence and crystal defects of the Frenkel type. The observed mechanisms are in agreement with the hypothesis of defect creation by ionization related to intrinsic luminescence, and the Pooley model seems therefore to be valid. The experimental set up is described with regard to the Van de Graaf electron beam, Jarrel Ash UV spectrometer, temperature control, and vacuum chamber. Naked eye, zero order, Polaroid film observation, and data processing are reported. ESRO

N75-23257# Interuniversitair Reactor Instituut, Delft (Netherlands).
REACTION OF CHARGED SPECIES IN IRRADIATED CYCLOHEXANE WITH ADDED SOLUTES AS STUDIED BY STEADY STATE RADIOLYSIS. RELATIVE RATE CONSTANTS FOR REACTION OF THE POSITIVE AND THE NEGATIVE SPECIES WITH DIFFERENT SOLUTES
E. L. Davids, J. M. Warman, and A. Hummel [1974] 40 p refs Submitted for publication
(IRI-133-73-13) Avail: NTIS HC $3.75

The yield of scavenging electrons in irradiated cyclohexane by CH3Br and CH3Cl and of the positive species by cyclopropane in the presence and absence of other solutes that react with one or both of the charged species was studied. The observed concentration dependences of the scavenging yields are described in terms of an ion-pair picture; the diffusion coefficient of the positive species is much smaller than that of the negative species but much larger than that of a molecular ion. Relative rate constants for the reactions of several solutes with the positive and the negative species are determined from the concentration dependence of the scavenging yields. Known value of absolute rate constant for the reaction of the excess electron with triphenylmethylchloride absolute rate constants are calculated. Author (ESRO)

N75-23258# National Bureau of Standards, Boulder, Colo. Quantum Electronics Div.
ANALYSIS OF OPTICALLY EXCITED MERCURY MOLECULES Final Report
R. E. Drullinger, M. M. Hessel, and E. W. Smith Jan. 1975 53 p refs Sponsored in part by ARPA and LASL
(COM-75-50112/2; NBS/MN-143) Avail: NTIS MF $2.25; SOD HC as C13.44:143 CSCL 07D

The Hg2 molecule representative of a class of molecules which have dissociative ground states and bound excited states is used as a prototype of this class of molecules which are of interest as potential laser candidates. Measurement techniques are developed to obtain potential curves, f-values, and kinetic behavior for Hg2. These techniques are applicable to this whole class of dissociation molecular systems. GRA

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation*.

N75-23259 Arizona Univ., Tucson.
MEASUREMENT OF REACTION CROSS SECTIONS FOR (Ca-40)(ALPHA, GAMMA)(Ti-44), (Ca-48)(ALPHA, PROTON, (Sc-43), AND (Ca-48)(ALPHA, NEUTRON)(Ti-51) WITH APPLICATIONS TO NUCLEOSYNTHESIS IN STARS Ph.D. Thesis
Delmar Lee Barker 1974 108 p
Avail: Univ. Microfilms Order No. 75-4137

The cross section for the reactions Ca-40 (alpha, gamma) Ti-44, Ca-40 (alpha, p) Sc-43, and Ca-48 (alpha, n) Ti-51 were measured between the center of mass energies of 3.5 MeV and 9.0 MeV. These cross sections were used to calculate reaction rates as a function of temperature for stellar interior and compared to theoretical predictions of the equivalent square well model.
Dissert. Abstr.

N75-23260 Cornell Univ., Ithaca, N.Y.
APPLICATION OF AN INTENSE RELATIVISTIC ELECTRON BEAM TO MICROWAVE GENERATION Ph.D. Thesis
Yuval Carmel 1975 152 p
Avail: Univ. Microfilms Order No. 75-8585

Unneutralized beam propagation and stability in an axial guide magnetic field, microwave generation using cyclotron wave instabilities, and the role of collective effects in determining optimum generation conditions are discussed. It was shown both experimentally and theoretically that an annular relativistic unneutralized electron beam traveling in an axial magnetic field is subject to instabilities leading to microwave generation. The theories of cyclotron and space charge wave instabilities are reviewed and applied to the experiments investigating the propagation and stability of unneutralized beam motion along a magnetic field. A detailed account is presented of microwave generation experiments using the fast cyclotron wave interaction occurring as a result of motion of the beam through a rippled magnetic field. The results are discussed of an investigation of the role of anisotropy in the particle distribution function as a source of free energy to drive the instability, and the microwave emission obtained by injecting the beam through multiple scattering foils is described. Scale processes for operation at high beam energies are also reported. Dissert. Abstr.

N75-23261 Ernst-Mach-Inst., Freiburg (West Germany).
MAGNETIC ENERGY ANALYZER FOR SLOW ELECTRONS Ph.D. Thesis - Tech. Hochschule Aachen)
Wolfram Limberg Aug. 1974 57 p refs In GERMAN; ENGLISH summary
(Rept-4/74) Avail: Issuing Activity

A differential spectrometer with high time and energy resolution was developed using the principle of energy analysis with a longitudinal homogeneous magnetic field. This way it is possible to measure the energy distribution of low energy electrons (eV-range) in the presence of high energy electrons without distortions by secondary electrons. The functioning and application of the analyzer is demonstrated by measuring the energy distributions of slow electrons emitted by a filament.
Author (ESRO)

N75-23262# Technical Research Centre of Finland, Helsinki. Nuclear Engineering Lab.
CURVED LOW ORDER ANGULAR ELEMENTS IN TWO DIMENSIONAL NEUTRON TRANSPORT PROBLEMS
P. Silvennoinen and J. Tuominen 1974 14 p refs
(Publ-8) Avail: NTIS HC $3.25

A two-dimensional finite element scheme is presented. The angular discretization is based on curved rather than rectangular elements. Numerical computations performed indicate improved accuracy as compared to rectangular methods of a same order. No ray effects are found even in low order results. In addition to linear trail functions, with higher degree polynomials are discussed. Author

N75-23263# Bhabha Atomic Research Centre, Bombay (India).
LUBRICANTS IN NUCLEAR TECHNOLOGY: A BRIEF REVIEW
S. B. Srivastava and V. B. Thomas 1974 19 p refs
(BABC-751) Avail: ERDA Depository Libraries HC $4.00

The report summarizes the current status of the development and the use of lubricant for variety of purposes in nuclear technology. Author (NSA)

N75-23264# Ames Lab., Iowa.
HIGH ENERGY PHYSICS, NUCLEAR SCIENCES, MATERIALS SCIENCE, MOLECULAR SCIENCES Annual summary report, 1973
Nov. 1974 135 p refs
(Contract W-7405-eng-82)
(IS-3500) Avail: NTIS HC $5.75

Abstracts are presented of papers published during the previous calendar year in the areas of high-energy physics, nuclear sciences, materials science (including metallurgy and ceramics, solid state physics, and materials chemistry), and molecular sciences (including radiation and separations research, chemical and geophysical energy, molecular and atomic science), and mathematical and computer sciences. The emphasis is strongly on materials and molecular sciences. NSA

N75-23265# Battelle-Northwest, Richland, Wash.
HELIUM COOLANT COMPATIBILITY WITH CANDIDATE FUSION REACTOR STRUCTURAL MATERIALS
L. A. Charlot and R. E. Westerman 15 Jul. 1974 38 p refs
(Contract AT(45-1)-1830)
(BNWL-1842) Avail: NTIS HC $3.75

The following topics are covered: Thermodynamic free energies of compound formation for oxides, carbides, and nitrides of niobium and molybdenum; terminal solubility data for the compound phase solid solution; and pressure temperature composition for contaminant/solid solution equilibria. Also included is a summary of diffusivity data for oxygen, nitrogen, and carbon in niobium and molybdenum, since these kinetic data relate to the distribution of contaminant within the metal. The effects of bulk metal corrosion and interstitial contaminants on the mechanical properties of stainless steels, niobium- and molybdenum-base alloys are summarized. Some containment/environment criteria are summarized. NSA

N75-23266# Joint Inst. for Nuclear Research, Dubna (USSR). Dept. of New Acceleration Methods.
PHASING SYSTEM FOR A COLLECTIVE ACCELERATOR
Z. G. Gavrilova and G. A. Ivanov 1974 22 p refs In RUSSIAN
(JINR-P9-8227) Avail: ERDA Depository Libraries HC $4.25

The possibility of synchronizing the single clusters with the hf accelerating field phase is considered. As a phasing system a spiral waveguide with parameters beta = 0.2 to 0.5, E = 5 to 10 kV/cm, and wavelength = 2 m is considered. The calculation of the phase trajectories, performed using a computer, revealed the possibility of obtaining, at the mentioned parameters, the capture coefficient of 90%. The phase scattering value at the output of the system is 70 deg, the system length being 6 m.
Author (NSA)

N75-23267# Commissariat a l'Energie Atomique, Saclay (France).
LIFETIME MEASUREMENT USING THE DOPPLER SHIFT ATTENUATION: DISCUSSION AND COMPUTER PROGRAMS
H. Rosin May 1975 131 p refs In FRENCH
(CEA-N-1715) Avail: ERDA Depository Libraries HC $9.75

Experimental difficulties encountered in using the Doppler shift attenuation method to measure lifetimes of heavy nuclei are examined. Main features of the method are given and problem areas identified. The advantages in using heavy-ion reactions are examined, which provide a new range of application of the method. The effects of various experimental procedures on the accuracy of results are analysed; in each case approximations and errors involved are discussed. Lifetimes can be derived from the measurements with the aid of the FORTRAN 4 computer codes provided. Both programs work for every experimental condition and include effects of the target thickness; DELMAX calculates the average maximum Doppler shift and the associated error. Energy losses in the target and detector solid angle effects are taken into account. Two approaches to the description of the stopping power were used, and the final results are compared. The separate influence of the nuclear and the electronic part of the slowing process is also studied. Author (NSA)

N75-23268# Air Force Weapons Lab., Kirtland AFB, N.Mex.
AFWL TECHNICAL OBJECTIVE NUMBER 3 NUCLEAR SYSTEMS SUPPORT Final Report, Apr. 1973 - Jan. 1975
William D. Collier Feb. 1975 21 p refs Supersedes AFWL-TR-73-89
(AD-A007223; AFWL-TR-75-81; AFWL-TR-73-89) Avail: NTIS CSCL 15/6

Every US Air Force aircraft and missile system with a nuclear capability must be conceived, developed, built, and operated in

accordance with nuclear safety standards. The Air Force must assure itself that systems being developed with a nuclear capability have nuclear weapons that are compatible with design, safety, and operational requirements of the Air Force. Air Force regulations and AEC/DOD agreements provide for the systematic integration of safety features into Air Force nuclear systems during all phases of development, acquisition, and operational employment. AEC must be provided with criteria, requirements, and guidance on nuclear bomb/warhead development and integration with specific delivery systems to ensure compatibility with Air Force systems. GRA

N75-23269# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
PRINCIPLES OF AUTOMATION OF PROGRAMMING OF ELECTRON BEAM TECHNOLOGICAL PROCESSES
V. P. Derkach, V. P. Karagodov, and V. M. Korsunskii 23 Jan. 1975 18 p refs Transl. into ENGLISH from the book "Metody Miniatyurizatsii i Avtomatizatsii Proizvodstva Komponentov EVM" Kiev, 1972 p 18-29
(FTD Proj. T74-05-12)
(AD-A006861; FTD-HT-23-0712-75) Avail: NTIS CSCL 13/8
Major elements of a proposed approach to programming various electron beam technological processes are presented. The approach is demonstrated by means of electron beam micromilling microtexts. Recommendations on the selection of systems of standard procedures used for the economical description of technological processes are given. J.M.S.

N75-23466 Joint Publications Research Service, Arlington, Va.
PROGRESS IN NUCLEAR RESEARCH OUTLINED
Ya. Kristov *In its* Transl. on Eastern Europe: Sci. Affairs, No. 463 (JPRS-64694) 5 May 1975 p 1-9 Transl. into ENGLISH from Priroda (Sofia), no. 1, 1975 p 7-12 (For availability see N75-23465 14-99)

74 OPTICS

Includes light phenomena.

N75-23270 Princeton Univ., N.J.
THE OPTICAL PROPERTIES OF DILUTE SILVER-MANGANESE ALLOYS Ph.D. Thesis
Matthew David Miller 1974 130 p
Avail: Univ. Microfilms Order No. 75-6657
The optical properties of dilute Ag:Mn alloys have been measured by differential elliposometry and differential reflectivity in the energy range 0.4-5.5 eV. The range of concentration of manganese was 1.0 to 10.0 atomic per cent. The samples were metal foils, evaporated and annealed under ultra-high vacuum conditions, but the optical measurements were carried out in air. A coating of MgF2 was deposited prior to exposure to air, in order to prevent corrosion. These samples showed only one of the two peaks in the optical adsorption previously reported in the literature. The second peak could be made to appear only by exposing unprotected samples to room air. The peak which was observed on protected samples scaled well with concentration, but it was weaker and broader than Kjollerstrom's theory for the adsorption in dilute magnetic alloys would predict. Dissert. Abstr.

N75-23271 California Univ., San Diego.
STUDIES IN SPATIAL FILTERING Ph.D. Thesis
James Kim-Tzong Eu 1974 158 p
Avail: Univ. Microfilms Order No. 75-9481
An anisotropic Hilbert transform spatial filtering system for observing phase objects is discussed along with two methods of spatial filtering which perform differential operations upon the objects in order to enhance the gradients or edges. A mathematical theory for a real time optical correlator for optical signal detection is presented along with the experimental results on fingerprint and character recognition using this correlator. Dissert. Abstr.

N75-23272 Catholic Univ. of America, Washington, D.C.
CHARACTERIZATION OF OPTICAL FIBERS Ph.D. Thesis
Noel S. Balitactac 1975 53 p
Avail: Univ. Microfilms Order No. 75-10751
The use of glass fibers as a possible transmission medium for optical signals has resulted in techniques for evaluating the properties of bulk glass materials and the guiding characteristics of fibers drawn from these materials. An apparatus capable of measuring attenuation in glass fibers as a function of frequency to an accuracy of .00001 nep/cm in absorption coefficient was developed. A spectrophotometer is described, suitable for the measurements of very low loss (attenuation) coefficient in glass fiber in the wavelength range of 0.51 micron - 1.05 micron. The systematic errors involved in the use of unclad fibers were studied. The instrument is shown to be satisfactory in making measurements of attenuation coefficients of as low as 5 dB/km. Results of measurements on very low loss silica, coated and uncoated, which illustrates the performance of the instrument, are given. Dissert. Abstr.

N75-23273 Purdue Univ., Lafayette, Ind.
PHOTOEMISSION OF ELECTRONS AND HOLES FROM SURFACE CENTERS AT THE Si-SiO2 INTERFACE Ph.D. Thesis
Bruce Boyd Roesner 1974 139 p
Avail: Univ. Microfilms Order No. 75-10952
A technique for optically studying surface states was developed and subsequently used in determining the density, distribution into the oxide, and photo capture cross section of surface states at the Si-SiO2 interface. The photo voltage technique consists of holding the capacitance constant in a deeply depleted metal oxide silicon - C at liquid nitrogen temperatures, exposing the structure to infrared radiation, and monitoring the photo-induced charge in the gate voltage. Theoretical photo voltage responses have been derived for photo-absorption at bulk traps and at surface centers located either in the oxide or at the interface. Photo voltage responses of surface states at the thermally grown (dry) SiO2-Si interface are then presented and analyzed to determine the location and photo capture cross section of the surface centers. Dissert. Abstr.

N75-23274 Brown Univ., Providence, R.I.
CATHODOLUMINESCENCE SPECTRA OF THE SEMICONDUCTORS Cu2S AND CuInS2 AND THEIR CHARACTERIZATION FOR PHOTOVOLTAIC APPLICATION Ph.D. Thesis
Steven David Mittleman 1974 110 p
Avail: Univ. Microfilms Order No. 75-9210
The use of cathodoluminescence as a nondestructive, easily used method of characterizing these semiconductor materials is demonstrated. In the case of the Cu-S system it was found that of all the compounds tested only Cu2S emits a cathodoluminescence spectrum. The spectrum consists of a band whose maximum lies at a photon energy corresponding to an energy gap of about 1.26 eV. In the case of polycrystalline CuInS2, stoichiometric powders exhibited bands at 0.87, 1.05, and 1.55 microns. Large changes were observed in this spectrum when the sulfur content of such powders was reduced by thermal treatment under vacuum at temperatures up to 500 C.
Dissert. Abstr.

N75-23275 Stanford Univ., Calif.
HIGHER ORDER NONLINEAR OPTICS PROCESSES IN SOLIDS AND LIQUIDS Ph.D. Thesis
Richard Francis Begley 1974 142 p
Avail: Univ. Microfilms Order No. 75-6807
Phasematched third harmonic generation of a CO2 laser in CdGeAs2, was observed. The bond charge model and the theory of nonlinear susceptibilities for free carriers was used to calculate the contributions from bond electrons and free carriers to the third harmonic process. The magnitude of the effective coefficient for Type 2 third harmonic generation in CdGeAs2 was measured and reveals a large magnitude. The tensor theory for fourth harmonic generation is developed in detail, and the bond charge model is extended to calculate fourth order tensor coefficients. A four-wave nonlinear mixing is studied as a technique for Raman spectroscopy studies. The technique which is called Coherent Anti-Stokes Raman Spectroscopy provides improvement in conversion efficiency over spontaneous Raman scattering. Dissert. Abstr.

N75-23276*# Steinmetz (William J.), Garden City, N.Y.
THE EFFECT OF THIN TURBULENT SHEAR LAYERS ON THE OPTICAL QUALITY OF IMAGING SYSTEMS
William J. Steinmetz Apr. 1975 41 p refs
(Contract NAS2-8066)
(NASA-CR-137666) Avail: NTIS HC $3.75 CSCL 20F

A modified C141 transport was outfitted with a 91.5-cm reflector telescope designed to view objects radiating outside the visible window in the infrared range from 1 micron to 1000 microns. The telescope is situated in a cavity which is operated open port. Spoilers were designed which reduce turbulence-induced excitation of the cavity. The aircraft was designed to operate at altitudes up to 15 km to significantly reduce the effect of the H2O and CO2. Furthermore, the optically degrading influence of the large-scale atmospheric turbulence on land-based telescopes is replaced by the effect of the turbulent shear layer resulting from the spoiler upstream of the cavity. A mathematical model was established to describe the effect of turbulent shear layers on imaging systems and to examine the parameters of interest relevant to potential wind-tunnel experimentation. Author

N75-23277# National Bureau of Standards, Washington, D.C. D. C. Heat Div.
OPTICAL RADIATION MEASUREMENTS: DESCRIBING SPECTROPHOTOMETRIC MEASUREMENTS Final Technical Note
William H. Venable, Jr. and Jack J. Hsia Nov. 1974 51 p refs
(COM-74-51187/4; NBS-TN-594-9; LC-74-600159) Avail: NTIS MF $2.25; SOD HC as c13.46:5949 CSCL 20F

A general method is presented to describe spectrophotometric measurements mathematically. All space is divided into instrument space or sample space. Idealized absolute and relative measurements are defined at the boundary between the instrument and sample space by four descriptors: a radiance input L, a scattering function S, a relative responsivity R, and a scaling function K. Real measurements are also defined at the boundary and described by these four descriptors, and general expressions for fractional error are derived. A 45-degree, 0-degree reflectance measurement was used as a specific example to illustrate an application of this method to describing measurements and performing an error analysis. GRA

N75-23278# Catholic Univ. of America, Washington, D.C. Vitreous State Lab.
DEVELOPMENT OF IR TRANSMITTING CHALCOGENIDE WINDOWS Final Technical Report, 1 Apr. 1972 - 30 Sep. 1974
Cornelius T. Moynihan, Pedro B. Macedo, Mohktar S. Maklad, Robert K. Mohr, and Regan E. Howard Feb. 1975 39 p refs
(Contract N00014-67-A-0377; ARPA Order 2138)
(AD-A006978) Avail: NTIS CSCL 20/6

A quantitative study of infrared absorption in the 250-4000/cm region of As2Se3 glasses doped with small amounts of As2O3 or purified has been carried out with particular attention to absorption in the wavelength regions of the CO2 and CO lasers. The dependence of the relative intensities of the oxide impurity bands in the 650-1340/cm region on the total amount of As2O3 added to the glass indicates the existence of three distinct oxide impurity species. A number of higher frequency impurity bands which are due to the presence of hydrogen in the glass and whose intensities are highly dependent on the glass melting conditions have been observed and classified. Intrinsic multiphonon absorption coefficients of mixed As2Se3-GeSe2 glasses were found to be of the same magnitude at the same respective frequencies as those for pure As2Se3 glass. GRA

N75-23279# Arizona Univ., Tucson.
APPLIED OPTICS RESEARCH, FY74 Annual Report, 1 Jul. 1973 - 30 Jun. 1974
Peter A. Franken Jul. 1974 129 p refs
(Contract F04695-67-C-0197)
(AD-A007053; SAMSO-TR-75-19) Avail: NTIS CSCL 20/6

Reports are included on the following areas of research: atmospheric turbulence measurements; dimensional stability and thermal expansion measurements; infrared upconversion; lightweight mirror study; mathematical optics; optical design, manufacture, and testing; Pioneer mission; quantum optics; restoring methods; solar thermal power systems; and visual psychophysics. GRA

N75-23280# Alabama Univ., Huntsville. Dept. of Physics.
LOW LOSS WINDOW MATERIALS FOR CHEMICAL LASERS Semiannual Technical Report, 9 Jul. 1974 - 9 Jan. 1975
James A. Harrington Jan. 1975 30 p refs
(Contract DAAH-1-74-C-0437; ARPA Order 2614)
(AD-A006671; UAH-RR-166) Avail: NTIS CSCL 20/6

The increasing interest and importance of chemical lasers has led to a demand for further materials studies at DF and HF chemical laser frequencies. In order to meet this demand a small cw chemical laser has been built for calorimetric measurements of the absorption coefficient. A wide variety of low loss materials has been studied at DF (3.8 micrometers) and HF (2.7 micrometers) frequencies. In conjunction with the absorption measurements, chemical cleaning and polishing techniques have been developed and applied to some materials to determine their effectiveness in minimizing surface absorption. Calorimetric measurements of the optical absorption coefficient at chemical laser frequencies are reported on single and polycrystalline alkaline earth fluorides and alkali halides, single crystal magnesium oxide, sapphire, magnesium fluoride, strontium titanate, and other materials. Infrared spectrometer data on the absorption coefficient as a function of frequency for most of the materials studied are presented. As in past work, these data serve to indicate the value of the absorption coefficients expected in the HF-DF frequency regime. The infrared scans also reveal impurity structure in a few oxide materials in this same region. GRA

N75-23281# Naval Air Development Center, Warminster, Pa. Aero-Electronic Technology Dept.
LAWS OF TRANSMISSIVE SIMILARITY AND SCALE MODELS IN A LIGHT ABSORBING, RANDOMLY SCATTERING MEDIUM
Cyrus Beck 29 Oct. 1974 12 p
(AD-A006891; NADC-74116-20) Avail: NTIS CSCL 20/6

The concept of transmissive similarity for light transmitting systems is explained. The conditions for transmissive similarity are derived as functions of the ratios of the significant forces. The force ratio equivalents in terms of the number of scattering events per absorption event and of the root-mean-square value of refraction angle per scattering event are developed. How these force ratios relate to the transmitting medium's measurable optical properties, absorption coefficient a, scattering coefficient s and dispersion coefficient beta is presented. Applying the concept of transmissive similarity, the necessary and sufficient conditions for building a small or large scale model are presented and illustrated. The RMS value of photon path direction change per scattering event is calculated for the example given. GRA

N75-23282# Naval Missile Center, Point Mugu, Calif.
NEW RAY OPTICS MODEL FOR THE DIRECTIONAL DISTRIBUTION OF LIGHT REFLECTED FROM A ROUGH SURFACE
T. S. Trowbridge and K. P. Reitz 25 Feb. 1975 39 p refs
(AD-A006663; NMC-TP-75-01) Avail: NTIS CSCL 20/6

A new ray optics model is presented for the reflection of light (both within and without the nominal plane of incidence) from the rough air/material interface of a randomly rough surface. Such reflection is of particular interest to laser target designation systems. Unlike previous derivations that modeled the rough interface as consisting of microareas randomly oriented but flat (facets), this derivation models it as consisting of microareas not only randomly oriented but also randomly curved. Physically, the models are the same, but this new derivation leads to some new and useful results: (1) It is found that, for any given rough interface, there exists a single optically smooth curved surface of revolution (average irregularity) of very restricted shape that will reflect light in the same distribution as that reflected by the rough interface. (2) Modeling this average irregularity as an ellipsoid of revolution gives a surface structure function that is more accurate and useful than previously existing ones. (3) Unlike the facet derivations, this derivation lends itself to a normalization giving the absolute reflectance-distribution function. Reflection by this new interface model, combined with some

Lambertain reflection, is tested extensively both within and without the nominal plane of incidence on a variety of rough surfaces and is found to apply rather well. GRA

N75-23283# Hughes Research Labs., Malibu, Calif.
COHERENT OPTICAL ADAPTIVE TECHNIQUES (COAT) Final Report
J. E. Pearson, W. B. Bridges, L. S. Horwitz, R. M. Kubo, and T. J. Walsh Jan. 1975 151 p refs
(Contract F30602-73-C-0248; ARPA Order 1279)
(AD-A007032; RADC-TR-75-46; QTR-5) Avail: NTIS CSCL 17/8

There are two primary objectives of this program. The first objective is to determine the performance limits of coherent optical adaptive techniques through operation of an experimental, visible prototype multidither COAT system through a representative turbulent atmosphere against a complex dynamic target. The second objective is to determine the best methods of employing COAT in high power laser systems and to assess the status of necessary key high power components. This report covers the range measurements phase of the contract during which detailed studies were made on COAT compensation for atmospheric turbulence using the 18-element visible system developed earlier in the contract. GRA

N75-23284# Sperry Rand Research Center, Sudbury, Mass.
OPTICAL SWITCH STUDY Final Technical Report, 1 Mar. - 1 Oct. 1974
Richard A. Soref and L. Robert Schissler Feb. 1975 138 p refs
(Contract F30602-74-C-0168; AF Proj. 4519)
(AD-A007009; SCRC-CR-74-6; RADC-TR-75-3) Avail: NTIS CSCL 20/6

Nineteen techniques for implementing an optical communications switch in an integrated optical circuit have been examined. The optical matrix switch is intended to interconnect n optical inputs with n optical outputs at a 10 GHz bandwidth. The most promising optical switching approaches were found to be electrically-controlled, optical directional-couplers and electro-optic, Bragg, diffraction-gratings. Both are realizable in optical microcircuit form. An optical balanced bridge is the optimum form of the coupler switch. The switchable couplers can be built from optical channel waveguides that have 2D mode confinement, while the gratings would be embodied in a slab guide with 1D confinement. The latter arrangement is more vulnerable to optical crosstalk in a matrix. Electro-optic phase perturbation in the deflectors and couplers is preferred for its simplicity, low driving power, and nanosecond switching speeds. An n squared matrix array of switches has been designed with 2n absorbing terminations at the unused ports. GRA

N75-23285# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
TRANSIENT RADIATION-EFFECTS TESTS OF A CORNING RADIATION RESISTANT OPTICAL FIBER Physical Science Research Papers
James A. Wall 6 Jan. 1975 19 p refs
(ARPA Order 2490)
(AD-A006679; AFCRL-PSRP-622; AFCRL-TR-75-0012) Avail: NTIS CSCL 20/6

Semi-transient and transient radiation-effects tests were performed on a Corning low-loss, radiation-resistant optical fiber. The semi-transient tests, which involved measurement of the fiber transmission during and after irradiation with X-rays, show this fiber to be much more resistant to permanent damage by radiation than other available glass fibers. The transient radiation-effects tests, in which the response of the fiber was measured during and for short times after pulses of X-rays and neutrons, show that the fiber may not be applicable to systems that cannot tolerate operational lapses of a few microseconds duration. This is because the fiber emits fluorescent radiation and shows temporary transmission losses during and shortly after pulses of radiation. GRA

N75-22852 Joint Publications Research Service, Arlington, Va.
REFLECTIVITY OF CERTAIN MATERIALS IN THE SPECTRAL REGION OF 1-13 MICRONS
O. I. Popov, V. I. Semenova, and Ye. O. Fedorova *In its* Meteorol. and Hydrology, No. 2, 1975 (JPRS-64670) 1 May 1975 p 140-144 refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 2, 1975 p 111-113 (For availability see N75-22834 14-42)

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.
For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N75-23286 Wisconsin Univ., Madison.
ALPHA PARTICLE ENERGETICS AND NEUTRAL BEAM HEATING IN TOKAMAK PLASMAS Ph.D. Thesis
David George Mcalees 1974 144 p
Avail: Univ. Microfilms Order No. 74-27750

Both center around plasma and particle dynamics and are critical to the success of deuterium-tritium fueled fusion power systems. The energetic aspects of the 3.5 MeV alpha particles produced in D-T fusion events are examined, and physical phenomena which can be expected to occur in future devices containing alphas are predicted. The model of the alpha particle dynamics includes toroidal magnetic field gradient and curvature drifts and motion along the magnetic field lines. Guiding center motion of alpha particles in various size plasma systems is analyzed. It is shown that finite gyro-radius effects play a basic role in determining alpha particle behavior for feasibility size plasmas (I = 2-5 MA). The alpha particle containment properties for feasibility and reactor size devices are computed. For devices with I > 2 MA, greater than 75 percent of the alpha particles produced in the plasma are contained, i.e., are on orbits which do not intersect the plasma boundary. Dissert. Abstr.

N75-23287 Indiana Univ., Bloomington.
DEVELOPMENT OF A PRACTICAL MICROWAVE PLASMA ATOMIC EMISSION SOURCE WITH A MICROARC SAMPLE ATOMIZER Ph.D. Thesis
Lawrence Richard Layman 1974 171 p
Avail: Univ. Microfilms Order No. 75-9023

A low power microwave excited plasma atomic emission source was developed which overcomes difficulties encountered with previous systems in the effective introduction of samples into the plasma. To solve these difficulties a microarc sample atomizer was designed. This high voltage, low current, pulsating dc, discharge efficiently vaporizes predried, discrete volumes of sample solution into the plasma where their atomic emission can be efficiently excited. The combined source (microwave plasma and microarc sample atomizer) is shown to possess many desirable features, including sensitivity (picogram detection limits for most elements), precision (+ or - 5%), stability, low background emission, and minimal interference effects. Axial viewing of the plasma and electronic measurement of sample volumes were used to increase precision in the overall determination. Dissert. Abstr.

N75-23288 New York Univ., N.Y.
THE STABILITY OF A CLASS OF BIFURCATED MAGNETO-HYDRODYNAMIC FREE BOUNDARY EQUILIBRIA Ph.D. Thesis
Jay M. Kappraff 1974 60 p
Avail: Univ. Microfilms Order No. 75-9668

The ideal magnetohydrodynamic free boundary model was employed to study the bifurcation of a family of helically symmetric equilibria. The equilibria are intended to approximate the stellarator experiment with low plasma pressure and L = 2 helical symmetry. The study was carried out in a plasma column of finite length, surrounded by a vacuum region, all enclosed within an outer conducting wall. The straight helical equilibria were obtained by expansion in two parameters c and epsilon, the ratio of the helical magnetic field to the theta pinch field, and the product of the helical wavenumber times the plasma column radius, respectively. The distortion of the plasma column from a true cylinder is taken to be small of order c.C. The column length was chosen to avoid kink instabilities for some range of azimuthal wavenumbers, n, for which the theory applies, and the critical beta was obtained. Dissert. Abstr.

N75-23289*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DRIFT-FREE MAGNETIC GEOMETRIES IN ADIABATIC
David P. Stern and Peter Palmadesso (NRL) Apr. 1975 25 p refs Supersedes X-602-75-15 Submitted for publication
(NASA-TM-X-70884; X-602-75-105; X-602-75-15) Avail: NTIS HC $3.25 CSCL 20I

A class of two-dimensional drift-free fields, somewhat resembling the configuration found in the geomagnetic tail, is described; several proofs of the drift-free property are given, including some that suggest that the property of vanishing net drift might extend to nonadiabatic orbits. A general criterion for identifying drift-free fields was developed, and a case of motion in a nearly drift-free field was also investigated. The theory was applied to the plasma sheet in the earth's magnetotail, and observational evidence is presented suggesting that the magnetic field there does approach a drift-free configuration. Author

N75-23290# Texas Univ., Austin.
ELECTROSTATIC TRAPPING OF HIGH-Z IMPURITY IONS AND ALPHA-PARTICLE TRANSPORT IN TOKAMAK PLASMAS
R. D. Hazeltine, A. A. Ware, D. J. Sigmar (MIT, Cambridge), S. P. Hirshman (MIT, Cambridge), J. E. McCune (MIT, Cambridge), E. C. Crume (ORNL), J. T. Hogan (ORNL), and J. F. Clark (ORNL) 1974 23 p refs Presented at the 5th Conf. on Plasma Phys. and Controlled Nuclear Fusion Res., Tokyo, 11 Nov. 1974
(Contract AT(11-1)-3070)
(Conf-741105-46; IAEA-CN-33/A15-3) Avail: NTIS HC $3.25

Neoclassical effects are reported resulting from the nonuniform density of impurity ions on a magnetic surface. Nonuniformity arises partly from toroidal effects directly and partly from the associated electrostatic potentials. There is a new pinch effect involving passing particles and a corresponding bootstrap current. There is no increase in electron diffusion; the diffusion driven by the friction of the bootstrap current is cancelled by the interaction of the Pfirsch-Schluter current with the variable part of the resistivity. At the high collision frequency end of the plateau regime, the pressure gradient needed to balance the combined pinch effects is substantially increased; this will help explain the increase in -dTe/dr with decreasing radius observed in ST. Thermalized alpha-particle and fuel ion diffusion were studied in a reactor-like Tokamak plasma. Author (NSA)

N75-23291# Maryland Univ., College Park. Inst. for Fluid Dynamics and Applied Mathematics.
COLLISIONLESS SHOCK STUDIES USING LASER-PRODUCED PLASMAS
D. W. Koopman 1974 19 p refs
(Contract AT(40-1)-3819)
(ORO-3819-6) Avail: NTIS HC $3.25

Phenomena in counterstreaming plasmas were investigated, employing a laser-produced plasma expanding into an ionized background. Plasma parameters, diagnostic apparatus, ionizing potential waves, collisional precursor and momentum coupling processes, and collisionless interactions in magnetic fields are reviewed. Citations to publications derived from the research program are given. Author (NSA)

N75-23292# Iowa Univ., Iowa City. Dept. of Physics and Astronomy.
THERMAL RELAXATION OF PLASMA IN A UNIFORM MAGNETIC FIELD
J. Y. Hsu, G. Joyce, D. Montgomery, L. Turner (Wisconsin Univ., Madison), and G. Vahala (Courant Inst. of Mathematical Sciences, New York) Aug. 1974 15 p refs Presented at the 2d Intern. Conf. on Plasma Theory, Kiev, 28 Oct. 1974
(Contract AT(11-1)-2059)
(COO-2059-41; Conf-741024-2) Avail: NTIS HC $3.25

A formulation of the theory of the thermal relaxation of uniform plasmas is given which includes the effect of a uniform dc magnetic field at the microscopic level, both in two and three dimensions. To increase the magnetic field is to increase the relaxation time, linearly in two dimensions and logarithmically in three. The gyroradius of the lighter species of particle behaves as a cutoff for the Coulomb potential in the collision integral for two species when the Debye length is greater than the smaller gyroradius. A satisfactory kinetic theory, without divergences, is given for many phenomena without reference to Debye screening or the dielectric nature of the plasma. Author (NSA)

N75-23293# Battelle-Northwest, Richland, Wash.
INTERESTING POSSIBILITIES OF FUSION-FUSION
R. W. Werner, J. D. Lee, R. W. Moir, G. A. Carlson, M. A. Peterson, W. C. Wolkenhauer, and B. R. Leonard, Jr. 30 Sep. 1974 12 p refs Presented at the 5th Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., Tokyo, 11 Nov. 1974 Sponsored by ERDA
(BNWL-SA-5069-Rev; Conf-741105-47; UCRL-75527; IAEA-CN-33/G6-1) Avail: NTIS HC $3.25

The hybrid reactor, a fusion plasma source driving a subcritical fission assembly, is discussed. Hybrids combine neutron-rich but power-poor fusion, with power-rich but neutron-poor fission. Hybrids may be realizable before pure fusion since they substantially relax the plasma and engineering requirements. A fissile blanket could be designed with one or more of the following primary goals: energy amplification in a power reactor, production of fissionable fuel, and/or an interim system in the development of pure fusion. System components other than the blanket must also be considered. A complete design study has been started in order to determine whether the hybrid can be economically competitive and environmentally acceptable in a time period that precedes pure fusion. Author (NSA)

N75-23294# Association Euratom-CEA, Fontenay-aux-Roses (France).
ANALYSIS OF LIGHT SCATTERING DATA FROM RELATIVISTIC PLASMAS
M. Mattioli and R. Papoular Apr. 1974 20 p refs
(EUR-CEA-FC-732) Avail: ERDA Depository Libraries HC $4.00

The relativistic theory developed previously for the spectral profile of a Thomson-scattered wave is applied to the highest temperatures expected from currently planned fusion machines (25 keV). Adequate procedures for data reduction and error analysis are described and applied to experimental results collected on TFR. These computations yield relativity-corrected temperatures and error bars which differ already considerably from those obtained by the usual procedures. The temperatures are as much as 35% lower, and the errors 50% less, than the corresponding classical values. NSA

N75-23295# Association Euratom-CEA, Grenoble (France).
NUMERICAL INVESTIGATION OF MHD STABILITY IN AXIALLY SYMMETRIC CONFIGURATIONS FOR ANY CROSS SECTIONS
J. Weisse and P. Grelot Apr. 1974 77 p refs In FRENCH
(EUR-CEA-FC-735) Avail: ERDA Depository Libraries HC $7.00

The MHD equilibrium and stability of an axisymmetric toroidal plasma in a Tokamak-like configuration with noncircular cross section was studied. A special family of shell shapes was considered. The results obtained when using a flat current profile (j nonequal to zero on the boundary) are compared with those obtained with a parabolic profile (j = 0 on the boundary). NSA

N75-23296# Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France).
PROTOTYPE OF THE FAST NEUTRAL INJECTOR TO TFR
R. Becherer Jun. 1974 9 p refs Presented at the 8th Symp. on Fusion Tech., Noordwijkerhout, Netherlands, 17 Jun. 1974
(CEA-Conf-2712; Conf-740630-7) Avail: ERDA Depository Libraries HC $4.00

To obtain a significant increase in temperature in the TFR, the injection of about 300 kW of fast neutral hydrogen beams at energies between 30 and 50 kV is planned using two lines of injection, each line composed of 5 sources. A prototype was built to test the engineering aspects of the construction and the performance of one neutral beam in experimental conditions as close as possible from those which will exist in TFR. A description of the main elements of the experimental facility and a discussion of the working parameters are given. Author (NSA)

N75-23297# Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France).
HIGH VOLTAGE AND CURRENT SUPPLY FOR NEUTRAL INJECTORS
A. R. Bariaud, J. F. Bonnal, R. Dei-Cas, P. H. Rebut, and J. Lisser Jun. 1974 5 p Presented at the 8th Symp. on Fusion Tech., Noordwijkerhout, Netherlands, 17 Jun. 1974
(CEA-Conf-2711; Conf-740630-6) Avail: ERDA Depository Libraries HC $4.00

To increase the plasma temperature of the TFR Tokamak at Fontenay-aux-Roses, the method of injection of fast neutral beams is described. High voltage and current power supplies to accelerate ions produced by ion sources before neutralization are defined for this special purpose. Each unit can deliver 60 kV, 20 A and feeds two lines of injectors. As the injection time is pulsed during 200 ms every 2 minutes, an electronic device is studied to restore the voltage after application of the current and also to protect the electrodes and the supplies when breakdown occurs between the electrodes. Author (NSA)

N75-23298# Stevens Inst. of Tech., Hoboken, N.J. Dept. of Physics.
PLASMA INJECTOR FOR HTP REACTORS Final Scientific Report, Jun. 1971 - Mar. 1974
Milos Seidl May 1974 12 p refs
(Grant AF-AFOSR-2121-71; AF Proj. 9752)
(AD-781274; SIT-P283; AFOSR-74-0986TR) Avail: NTIS

A study has been made of the feasibility of producing neutralized ion beams by accelerating the ions in a plasma sheath produced by the interaction of an electron beam with gas. This complex process has been subdivided into three areas, beam-plasma interaction, plasma production, and formation of the plasma sheath, which have been studied in some detail. It has been found that the hot electron distribution needed for supporting the plasma sheath can be obtained by beam-plasma interaction. More research is needed for the control of the potential profile in the sheath. Author (GRA)

N75-23299# Oak Ridge National Lab., Tenn.
NEUTRAL BEAM INJECTION EXPERIMENTS IN ORMAK
L. A. Berry, C. E. Bush, J. L. Dunlap, P. H. Edmonds, T. C. Jernigan, J. F. Lyon, M. Murakami, and W. R. Wing [1974] 11 p refs Presented at 5th Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., Tokyo, 11 Nov. 1974 Sponsored by ERDA
(Conf-741105-42; IAEA-CN-33/A5-2) Avail: NTIS HC $3.25

An equilibrium study of plasma heating and other effects due to neutral beam injection is described which includes coinjection and counterinjection. Ion temperature increases are observed with coinjection and are in agreement with theoretical predictions in magnitude and in scaling with plasma density. Little charge-exchange beam power loss, effective ionic charge, and significant beam energy transfer to the plasma are indicated by measurements of parallel and perpendicular beam ion energy distributions. The main effect of injection of electrons was found to be alteration of the radial distributions of electron temperature and density. Counterinjection was found to be less effective than coinjection in plasma heating and to have a deleterious effect on the discharge parameters, stability, and confinement. Author (NSA)

N75-23300# Naval Research Lab., Washington, D.C.
THE USE OF A SOLID TARGET IRRADIATED BY A HIGH-POWER LASER PULSE AS A SOURCE OF COLD GAS FOR LASER HEATING EXPERIMENTS
J. R. Greig and R. E. Pechacek Feb. 1975 22 p refs
(NRL Proj. H02-28; RR0110941)
(AD-A006837; NRL-MR-2994) Avail: NTIS CSCL 20/9

The goal of these experiments is to provide a modestly warm plasma which is contained in a magnetic well suitable for future fast compression experiments. Presently, as part of the LINUS Program at NRL, the authors are thinking in terms of a Cusp magnetic field. In this paper, they report the results of efforts to create such a puff of gas by irradiating a polyethylene target with 1.06 micrometer radiation from a Q-switched Nd/glass laser. GRA

N75-23301# California Univ., Los Angeles. Plasma Physics Group.
NONLINEAR GENERATION OF INTENSE LOCALIZED ELECTRIC FIELDS IN PLASMAS
George J. Morales and Yee Chun Lee Feb. 1975 36 p refs
(Contract N00014-69-A-0200-4023)
(AD-A006668; PPG-211) Avail: NTIS CSCL 20/9

Over the past year several theoretical studies, computer simulations, and laboratory experiments have established that sharply localized electric fields of high intensity can be nonlinearly generated in plasmas under a wide variety of conditions. In this paper the authors present a brief survey of the physics underlying the formation of these localized electric fields, examine the experimental evidence which supports their existence, and sketch briefly the relevance of these structures to the problem of laser fusion and the theory of strong plasma turbulence. GRA

N75-23302# State Univ. of New York, Buffalo. Dept. of Engineering Science.
CORRELATION ANALYSIS OF TURBULENT PLASMAS Final Report, 1 Apr. 1972 - 30 Sep. 1973
David T. Shaw 1974 34 p refs
(Contract N00014-72-C-0412; NR Proj. 099-399)
(AD-A006744) Avail: NTIS CSCL 20/9

The objective of the program is to develop a method for the measurement of the correlation functions which in turn are used for the investigation of the nature of the instabilities and their role in the turbulent diffusion in the plasma. Special emphasis is placed on the testing of a diagnostic technique which is simple and sensitive enough for the relatively small volume and low density plasma source we used in the program. In the present report, the cross-beam correlation technique will first be discussed. This will be followed by a section on the use of laser interferometric method for the determination of electron density. In the last section, the important findings and recommendations will be discussed. GRA

N75-23303# Colorado State Univ., Fort Collins. Dept. of Electrical Engineering.
INVESTIGATIONS ON THE DYNAMICS OF MHD FLOWS Annual Summary Report, 1 Jan. - 31 Dec. 1974
H. E. Wilhelm 15 Jan. 1975 99 p refs
(Contract N00014-67-A-0299-0008; NR Proj. 099-389)
(AD-A006914) Avail: NTIS CSCL 20/9

Topics discussed include: Similarity solutions for magnetogas-dynamic diffuser and confuser flows with viscous, ohmic and thermal dissipation similarity theory for compressible gas flow in a cone with viscous and thermal dissipation MHD stability of the flow in a cylindrical liquid metal brush two-component similarity theory of plasma explosions with thermal and heat flux relaxation nonlinear hyperbolic thermal waves in metals. G.G.

N75-23304# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
INVESTIGATION OF THE OSCILLATORY DISCHARGE IN PAIRS OF CESIUM
Yu. A. Lashkov 18 Feb. 1975 15 p Transl. into ENGLISH Tsentr. Aerogidrodinam. Inst., Uch. Zap. (USSR), v. 2, no. 3, 1971 p 102-104
(AD-A006848; FTD-MT-24-0579-75) Avail: NTIS CSCL 20/9

Volt-ampere characteristics of gas discharge chamber filament electrode and autocathode are given for a series of values on magnetic intensity and cesium vapor concentrations. The cesium ionization occurs in the stationary electrical discharge in the weak magnetic field between the thermionic cathode and the anode. Author

N75-23305# Chalmers Univ. of Technology, Goteborg (Sweden).
WAVE PACKETS IN AN ABSORPTIVE AND STRONGLY DISPERSIVE MEDIUM Research Report
D. Anderson, J. Askne, and M. Lisak Sep. 1974 35 p refs
(PB-238960/9; RR-122) Avail: NTIS HC $3.75 CSCL 20/1

The evolution of slowly varying wave pulses in strongly dispersive and absorptive media is studied by recursive and Schrodinger methods. It is shown that the resulting envelope function may be obtained by including correction terms of arbitrary dispersive and absorptive order. Different concepts of pulse velocity are discussed in some detail. The initial pulse form and the

dispersion relation describing the medium determine the character of the pulse velocity. Finally, qualtitative examples of a Gaussian pulse in a cold plasma and an atomic medium are given, which illustrate the importance of higher order terms. GRA

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

N75-23306 University of Southern Calif., Los Angeles.
SUPERCONDUCTING PROPERTIES OF Nb3Sn-COPPER MIXTURES Ph.D. Thesis
Ulli Georg Hartmann 1974 161 p
Avail: Univ. Microfilms Order No. 75-6421

The material configuration sintered powder mixtures of Nb3Sn and copper was investigated which simulates the random connectivity and range of s.c. to normal metal ratios that might be expected to exist in a conductor break. Stability, critical currents, magnetization, and AC losses were determined for a number of samples with varying copper content and found to qualitatively follow the predictions of current theories. The normal conductivity of the mesh or sponge structure formed by the powder mixtures is explained by a recent heuristic modification to percolation theory, and this is expected to describe such filament breaks also. The increase in stability with increasing copper fraction was accounted for by dynamic and steady state stability theories for induced and impressed currents, respectively. Magnetization loops are analyzed in terms of the Bean and Kim critical state models, and results are consistent with the stability measurements. Dissert. Abstr.

N75-23307 Stanford Univ., Calif.
PROTON ENHANCED DIFFUSION OF CADMIUM IN INDIUM ANTIMONIDE Ph.D. Thesis
Cheol Kyoo Kim 1974 71 p
Avail: Univ. Microfilms Order No. 75-6873

Successful thermal predeposition of Cd in InSb was done without the formation of hillocks by developing a new source: 45-55 atomic percent cadmium antimonide alloy. Using this source, a junction depth of 0.3 micron was obtained following diffusion at 380 degree centigrade for 3 hours. Vacuum heating experiments determined maximum temperature for an uncoated sample at 360 C. A series of proton flux vs. energy experiments was performed and a line in the flux energy plane was determined which divides the plane into two regions. In one of these regions bombardment-produced damage is essentially fully annealed, while in the other it is not. Dissert. Abstr.

N75-23308 Case Western Reserve Univ., Cleveland, Ohio.
SUPERCONDUCTIVE TUNNELING IN MOLYBDENUM Ph.D. Thesis
Yue-Leung Pak 1974 128 p
Avail: Univ. Microfilms Order No. 75-5075

The technique of electron tunneling through a Schottky barrier which is created by a pointed single crystal of degenerate gallium arsenide in mechanical contact with a bulk molybdenum sample was used to obtain the superconducting energy gap and its temperature dependence for pure molybdenum. Some indication of phonon spectrum for molybdenum as well as gallium arsenide was observed from the tunneling characteristics. The transition temperatures of molybdenum and its very dilute alloys with iron concentrations up to 80 ppm were measured. There is no measurable superconducting energy gap for alloys with 27.5 ppm or more of iron in molybdenum while the transition temperature is nonzero. The spin-flip lifetimes of electrons due to magnetic impurities in alloys are calculated from both superconducting transition temperature results and resistivity measurements. A large zero-bias anomaly was observed in the gallium arsenide/molybdenum junctions. Dissert. Abstr.

N75-23309 Delaware Univ., Newark.
INVESTIGATION OF THE NEAR BAND EDGE PHOTOCONDUCTIVITY AND CLASS I CdS CRYSTALS Ph.D. Thesis
George Michael Storti 1975 158 p
Avail: Univ. Microfilms Order No. 75-6391

The photoelectronic behavior of Class I CdS crystals was investigated with emphasis on a study of the near-band-edge photoconductivity structure. The influence of heat treatment, surface absorbed oxygen, and X-ray irradiation was studied at liquid nitrogen temperature and room temperature by monitoring changes in the spectral distribution of the photoconductivity. Additional information on these influences was obtained by double beam experiments. The results are interpreted by postulating the existence of multicharged defect states of an acceptor-like character located in a near surface region of approximately 0.00001 cm thickness. Dissert. Abstr.

N75-23310 New York Univ., N.Y.
THERMOELECTRIC POWER IN DILUTE AND CONCENTRATED MAAGNETIC ALLOYS Ph.D. Thesis
Jerold Steven Touger 1975 160 p
Avail: Univ. Microfilms Order No. 75-5487

Thermoelectric power measurements between 4.2 and 300 K in one dilute (Ir-Fe) and two concentrated (Cu-Ni and Rh-Ni) magnetic alloys are reported. In the case of (Ir-Fe, the most prominent feature is an impurity induced peak which increases in magnitude but does not broaden significantly with increasing Fe concentration. The peak occurs at the spin fluctuation temperature determined by Kaiser and Doniach to be 28 K from resistivity data. Measurements on Cu-Ni and Rh-Ni, two concentrated magnetic alloy systems characterized by the existence of giant polarization clouds, observed an extra low temperature contribution to the thermopower of Cu-Ni for a broad range of compositions straddling the critical Ni concentration for ferromagnetism. The thermopower of Rh-Ni over a similar range of concentrations exhibits no extra contribution. Dissert. Abstr.

N75-23311 Oklahoma Univ., Norman.
THERMOELECTRIC SIZE EFFECT IN NOBLE METAL Ph.D. Thesis
Richard Foster Moreland 1974 89 p
Avail: Univ. Microfilms Order No. 75-6539

The difference between the thermoelectric power of thin foils ranging in size from 2.54 x 10-2 mm to 1.52 x 10-3 mm and a 0.254 mm wire of gold, copper, and silver was measured as a function of temperature from 4.2 K to 333 K. The electrical resistance of the wire and the foils was measured at 4.2 K, 77.3 K and 296 K. Analysis of the low temperature results suggests that the thermoelectric size effect can be used to determine sub-parts per million concentrations of magnetic impurities in the noble metals. Dissert. Abstr.

N75-23312 University of Southern Calif., Los Angeles.
INVESTIGATIONS OF ELECTRON IRRADIATION EFFECTS ON SiO2-Si SURFACES USING THE ENERGY DISTRIBUTION OF SECONDARY ELECTRONS Ph.D. Thesis
Kuang Yi Chiu 1974 107 p
Avail: Univ. Microfilms Order No. 75-6405

Surface potential changes in SiO2-Si surfaces under periodic electron bombardment were studied by using the energy distribution of secondary electrons produced by 3-10KV primary electrons. Oxides of various thickness, thermally grown by wet and dry processes on both N-type and P-type substrates of various resistivity were examined. It was found that the behavior of change in surface potential with beam chopping frequency depends very little on oxide thickness and type of oxide (dry or wet). The frequency dependence of the surface potential is interpreted as being due to radiation induced charge developed in the oxide at the oxide-semiconductor interface, greater positive charge being produced at low electron beam energies. This effect is qualitatively explained by the voltage dependence of processes that yield positive charge buildup. Dissert. Abstr.

N75-23313 New Mexico Univ., Albuquerque.
RADIATION EFFECTS ON GaAsP LIGHT-EMITTING DIODES AND SCHOTTKY BARRIER FIELD-EFFECT TRANSISTORS Ph.D. Thesis
Ranjeet Kumar Pancholy 1974 256 p
Avail: Univ. Microfilms Order No. 75-5882

New processes were developed for the fabrication of gallium-arsenide-phosphide light-emitting diodes and Schottky

barrier field-effect transistors. The fabricated devices were characterized electrically and were tested in a radiation environment. Transient effects on p-n junction diodes due to high energy electron beams were examined, and the permanent damage caused by high energy neutrons on both diodes and SBFETs were evaluated. Dissert. Abstr.

N75-23314 Massachusetts Univ., Amherst.
TWO DIMENSIONAL CARRIER FLOW IN A TRANSISTOR STRUCTURE UNDER NON-ISOTHERMAL CONDITIONS Ph.D. Thesis
Santosh Prasad Gaur 1974 110 p
Avail: Univ. Microfilms Order No. 75-6030

A two-dimensional mathematical model was developed to predict the internal behavior of power transistors operating under steady-state conditions. This model includes the internal self heating effects in power transistors, and is applicable to predict the transistor behavior under high current and high voltage operating conditions. The complete set of partial differential equations governing the bipolar semiconductor device behavior under nonisothermal conditions was solved by numerical techniques without assuming internal junctions and other conventional approximations. The compatible electrostatic potential, electron and hole charge density, and the temperature distributions at every point of a two-dimensional nonuniform grid were obtained. Computed results of the isothermal and nonisothermal analysis of a typical N-P-N power transistor design are presented for various operating conditions. Dissert. Abstr.

N75-23315 Stanford Univ., Calif.
EXPERIMENTAL STUDIES OF THE MICROWAVE PROPERTIES OF 8.6 GHz SUPERCONDUCTING NIOBIUM, NIOBIUM-TANTALUM, AND TANTALUM CAVITIES Ph.D. Thesis
Claude Marshall Lyneis 1974 141 p
Avail: Univ. Microfilms Order No. 75-6882

Measurements on the surface impedance of superconducting niobium, tantalum, and a 30 at% niobium-70 at% tantalum alloy are reported. The measurements were made on X-band TM010 mode cavities at a nominal frequency of 8.6 GHz. The surface resistance and the change of surface reactance for the three materials were measured from 1.3 K up to their respective transition temperatures. These data were compared to computer calculations based on the Mattis-Bardeen expressions for the surface resistance and reactance of superconductors. From the data analysis, the reduced energy gaps were found to be 3.70 + or - .02 for niobium, 3.55 + or - .02 for tantalum, and 3.61 + or - .03 for Nb30-Ta70. The electron mean free paths were also determined and found to be 500 A, 1500 A and 70 A respectively. Dissert. Abstr.

N75-23316 Wisconsin Univ., Madison.
MORPHOLOGICAL VARIATION OF CADMIUM CRYSTALS GROWN FROM THE VAPOR Ph.D. Thesis
Masaki Madono 1974 144 p
Avail: Univ. Microfilms Order No. 75-2468

In a cell filled with pre-purified hydrogen, cadmium crystals were grown from the vapor. The Pyrex fiber substrate was placed prependicular to the temperature gradient. As a result, crystals growing on the substrate manifested the morphology under a single condition of supersaturation and the temperature. Growth temperature was directly measured by a thermocouple located next to the substrate, and supersaturation was calculated from the two interior temperatures of the two ends of the cell. These interior temperatures were estimated from the corresponding exterior temperatures which could be directly measured. This way, supersaturation could be estimated to + or - 0.05. Growth temperature ranged between 260 C to 320 C, and at a given temperature, supersaturation varied from 0.05 to 0.5. Only above 295 C was whisker growth active. At a supersaturation of 0.3, this whisker growth was most active. Dissert. Abstr.

N75-23317 Rutgers Univ., New Brunswick, N.J.
MICROWAVE SURFACE RESISTANCE OF SUPERCONDUCTING NIOBIUM Ph.D. Thesis
Harvey Raymond Segal 1974 113 p
Avail: Univ. Microfilms Order No. 75-8441

Niobium samples with low tantalum concentration were outgassed in an ultrahigh vacuum at temperatures above 1800 C. The effect of various heat treatments and surface preparations were studied. The surface resistance was measured as a function of external magnetic field and temperature in three orientations of magnetic field with respect to microwave current and sample surface. The Caroli and Maki theory of oscillations of the order parameter for a clean type II superconductor did not agree with the experimental results, even for the highest quality sample used. The surface resistance measurements of the samples with short mean free paths were compared with various dirty limit theories. Dissert. Abstr.

N75-23318 Polish Academy of Sciences, Warsaw.
TRANSFER OF RECOIL ENERGY IN MOSSBAUER SPECTROSCOPY: REDUCTION OF THE STATE VECTOR [PRZEKAZ ENERGII ODRZUTU W SPEKTROSKOPII MOESSBAUERA: O REDUKCJI WEKTORA STANU]
Artur Szczepanski 1974 24 p refs In POLISH
Avail: Issuing Activity

Problems connected with the relaxation of long-life vibration modes of additional atoms in crystals were investigated along with the recoil energy transfer in gamma emission tracts through the nucleus of a connected crystal atom. Crystal networks, classic radiation theory, quantum electrodynamics, quantum theory, photons, and spontaneous emission are discussed.
Transl. by M.J.S.

N75-23319 South Carolina Univ., Columbia.
ELECTRICAL CONDUCTION MECHANISMS IN SEMICONDUCTORS Ph.D. Thesis
Heejoon Kang 1974 246 p
Avail: Univ. Microfilms Order No. 75-8677

A parallel conduction mechanism with the concept of a constant ionization energy was developed to provide a better understanding of the electrical conduction mechanisms in extrinsic semiconductors by removing some inconsistencies and by replenishing some shortcomings which still exist in the current electrical conduction theory. In the theory of semiconduction, it was believed that the ionization energy of a given impurity species decreases as the impurity concentration becomes larger, becoming zero at the Mott transition. Some theoretical bases were developed, to account for this decrease, and some experimental data were interpreted to prove this assertion. It was shown that the ionization energy is constant, being independent of the impurity concentration and temperature. Dissert. Abstr.

N75-23320 South Dakota School of Mines and Technology, Rapid City.
THERMAL CONDUCTIVITY MEASUREMENTS OF SILICON MONOXIDE USING THIN FLIM TECHNIQUES Ph.D. Thesis
Larry Allen Simonson 1974 89 p
Avail: Univ. Microfilms Order No. 75-9510

Thin film techniques were employed in the deposition of multilayer test samples. A physical mask system allowed the fabrication of test samples in a single pumpdown of the vacuum deposition chamber. A crystal monitoring system was used to monitor the thicknesses of deposited films of copper, nickel, and silicon monoxide. Interferometer techniques were also used to monitor the thickness of silicon monoxide during deposition. This method involves the concept of constructive and destructive interference patterns and provides a very useful non-destructive method of film thickness determination. An electrical analog model was developed to analyze the thermal conductivity data. The thermal conductivity of silicon monoxide was found experimentally to be approximately 0.015 watts/C/cm. Dissert. Abstr.

N75-23321 South Dakota School of Mines and Technology, Rapid City.
NUCLEATION AND GROWTH OF GOLD ON FRESHLY DEPOSITED SILICON MONOXIDE Ph.D. Thesis
Gary Overgaard Svarstad 1974 135 p
Avail: Univ. Microfilms Order No. 75-9511

Nucleation characteristics of gold deposited on a constant surface of virgin silicon monoxide were studied. Meticulous experimental methods were used to ensure that all experiments could be reproduced with identical results. Many depositions were made in order that the controlling deposition parameters

could be isolated. It was determined that the controlling parameters were the substrate temperature, the deposition rate, and the system pressure. Careful analysis of these parameters indicated that the deposition time necessary for a film to reach the critical thickness increased with increasing substrate temperature and with increasing system pressure and decreased with an increasing impingement rate. Dissert. Abstr.

N75-23322 South Dakota School of Mines and Technology, Rapid City.
EFFECTS OF ANTINONX DOPING ON TIN DIOXIDE FILMS PREPARED BY D. C. GLOW DISCHARGE SPUTTERING Ph.D. Thesis
Anant Govind Sabnis 1974 91 p
Avail: Univ. Microfilms Order No. 75-9508

The target is in the form of compressed SnO2 powder, and the films thus produced are conductive at room temperatures. By mixing Sb2O3 powder with SnO2 powder in varying proportions, it is shown that higher conductivity can be achieved with 9% Sb2O3. Conductivity and optical absorption increases with increasing Sb content, and transparency as high as 85% was obtained in doped films. An Sb2O3 content of 10% and more increases the lattice disorder of the films, thereby making them nonconducting. Such films can be made conducting by heat treatment; these films are n-type and nondegenerate. The activation energy decreases with increasing antimony content. Comments on volt-ampere characteristic and heterojunction devices are made, and the existence of slow trapping centers in the forbidden gap is also indicated. Dissert. Abstr.

N75-23323 California Inst. of Tech., Pasadena.
DEEP LEVELS AND HIGH CONCENTRATION OF IMPURITIES IN SILICON Ph.D. Thesis
Tsu-wei Frank Lee 1974 109 p
Avail: Univ. Microfilms Order No. 75-9532

A study of the electronic levels associated with the divacancy in silicon is reported. The extended Huckel theory is shown to reproduce the band structure of silicon near the energy gap. The electronic levels of the divacancy are calculated by considering a periodic array of large unit cells each containing 62 atoms; a 64 atom perfect cell with 2 atoms removed to form the divacancy. The results are found to be in qualitative agreement with the results of EPR and infrared absorption measurements. A theory of the variation of conduction electron density with the temperature for various impurity concentrations is presented. In addition to previously noted effects of conduction band edge lowering and screening of the impurity potential by the conduction electrons, the influence of a finite energy transfer integral and spatial fluctuation in the potential are included. Dissert. Abstr.

N75-23324 Rutgers Univ., New Brunswick, N.J.
THE LIQUID PHASE EPITAXIAL GROWTH AND CHARACTERIZATION OF NI-ZN FERRITE FILMS Ph.D. Thesis
Harold Saul Horowitz 1974 209 p
Avail: Univ. Microfilms Order No. 75-8403

Magnetic films of the composition Ni0.3Zn0.7Fe2O4 were epitaxially grown on single crystal MgO substrates by the liquid phase epitaxy technique. The substrates were held in a vertical plane and axially rotated during growth. Films were grown at temperatures ranging from 800 C to 1200 C and on (100) and (111) substrate orientations. The LPE dipping technique used was different than those previously reported for the growth of magnetic oxide films in that a relatively cold substrate was introduced into a homogeneously nucleated PbO-B2O3 fluxed melt which was not supercooled prior to substrate immersion. Morphological and topographical evaluation of the films was made by optical and scanning electron microscopy. Interfacial diffusion was investigated using energy dispersive X-ray spectrometry in combination with scanning electron microscopy. Dissert. Abstr.

N75-23325 Maryland Univ., College Park.
AN IN-SITU STUDY OF THE OPTICAL AND ELECTRICAL PROPERTIES OF AMORPHOUS GERMANIUM AS A FUNCTION OF THERMAL HISTORY Ph.D. Thesis
Nathan Bluzer 1974 185 p
Avail: Univ. Microfilms Order No. 75-9493

In-situ measurements of the temperature dependence of dc conductivity and frequency dependence of the optical absorption coefficient and index of refraction were carried out on amorphous Ge films deposited at 8 K in high vacuum. These measurements were repeated after in-situ annealing the Ge films at 30 K, 80 K, 130 K, 293 K, 379 K, 473 K, 573 K and 673 K. Several Ge films were deposited at higher temperatures (293 K, 440 K and 573 K) to obtain comparisons with the 8 K deposited films. The 573 K deposited Ge film was crystalline while the Ge films deposited at 8 K, 293 K and 440 K were amorphous. The electrical conductivity, following low temperature deposition, is much higher for the deposited amorphous germanium film than the 300 K annealed amorphous germanium film. Plots show that at low temperatures the thermal activation energy is small for all anneal states. The thermal activation energy of the Ge films studied monotonically increases with temperature. Dissert. Abstr.

N75-23326 California Univ., San Diego.
CONDUCTION ELECTRON INTERACTIONS IN ELECTRON SPIN RESONANCE Ph.D. Thesis
John Francis Dobson 1974 150 p
Avail: Univ. Microfilms Order No. 75-8255

The effect of exchange interactions among the conduction electrons is considered in relation to spin resonance, for two metallic systems: (1) For pure alkali metals a new surface spin-wave mode is predicted on the basis of Fermi liquid theory, and (2) for dilute local moments in a simple host metal the s-d model is used to explore conduction electron self-interaction effects in RPA. First a formal perturbation series is developed for the damping matrix. This is then used through second order to calculate resonance linewidths and g-shifts. A discussion of exchange enhancement of the Kondo g-shift is included. Dissert. Abstr.

N75-23327 California Univ., Santa Cruz.
NASCENT VORTICES IN TYPE 2 SUPERCONDUCTORS Ph.D. Thesis
Barry Louis Walton 1974 268 p
Avail: Univ. Microfilms Order No. 75-6985

The microwave surface impedance of the Type-II superconductor Pb sub 0.83-In sub 0.17 at 1.5 K has been measured at 35 GHz for the principle orientations of the applied magnetic field and the microwave currents in the sample. In addition, some measurements of the surface impedance of the superconducting alloys Pb sub 0.50-Tl sub 0.50 and Pb sub 0.83-In sub 0.17 at 1.5 K and at 1 GHz were made for peak microwave magnetic fields of up to and exceeding the lower critical field in the respective alloy. All of the experiments provide evidence for the existence of vortex nucleation sites or nascent vortices on sample surfaces parallel to the applied magnetic field. These nascent vortices have a core containing quasi-normal electronic excitations analogous to bulk vortices, and are lines of zero Ginzburg-Landau order parameter lying parallel to the applied field. Dissert. Abstr.

N75-23328 California Inst. of Tech., Pasadena.
PART 1: SOLID-PHASE GROWTH OF GERMANIUM STRUCTURES. PART 2: CONDENSATION OF INJECTED ELECTRONS AND HOLES IN GERMANIUM Ph.D. Thesis
Vincent Marrello 1975 127 p
Avail: Univ. Microfilms Order No. 75-9533

Two aspects of solid-phase semiconductor crystal growth were investigated; these included growth of epitaxial Ge layers from a solid solution of Ge in an Al film onto single crystal Ge substrate (solid-phase epitaxy), and growth of Ge crystallites in Al films from amorphous Ge films deposited on the Al film. Backscattering measurements, channeling effect measurements, electron microprobe measurements, Hall effect measurements, transmission electron diffractometry and scanning electron microscopy were conducted. The condensation of electrons and holes in Ge were produced by electrical injection of carriers. The recombination radiation from the condensate was analysed using an infrared spectrometer. Dissert. Abstr.

N75-23329 Brown Univ., Providence, R.I.
ANTIFERROMAGNETIC RESONANCES IN POLYCRYSTALLINE NICKEL OXIDE IN THE VERY FAR INFRARED AND MILLIMETER WAVELENGTH REGIONS Ph.D. Thesis
Cheng-hong Chen 1974 122 p

Avail: Univ. Microfilms Order No. 75-9133

The temperature dependence of the effective interval fields of polycrystalline nickel oxide was determined from antiferromagnetic resonance at submillimeter frequencies using Fourier transform spectroscopy and at millimeter wavelengths. In addition, the susceptibility of the sample was measured from 77 K to 750 K to obtain the effective Weiss exchange field constant using a Faraday balance type magnetometer. The temperature dependence of anisotropy constant indicated that simple dipolar interaction between the nickel ions cannot explain the experimental result in the vicinity of transition temperature, since the dipolar interaction gives a magnetization power dependence of two instead of three. Dissert. Abstr.

N75-23330 Illinois Univ., Urbana.
EMISSION AND CAPTURE OF ELECTRONS AND HOLES AT GOLD CENTERS IN SILICON AT THERMAL EQUILIBRIUM Ph.D. Thesis
Falke Hennig 1974 126 p
Avail: Univ. Microfilms Order No. 75-11690

The energy levels and the near equilibrium emission rates of electrons and holes at the gold center in silicon were obtained from dark capacitance transients, and the capture rates from photocapacitance transients in reverse biased P-N junctions. The devices used were mainly high resistivity P(+)N and N(+)P gold doped diodes. The gold energy levels were determined as a function of temperature. Temperature and field dependences of all the rate coefficients were measured, and the results were compared with the studies of other workers. The detailed balance relationship between corresponding capture and emission rates for the acceptor level is verified in the temperature range from 190 K to 290 K to within a factor of 2. The appendix describes studies of the effect of gold on the small signal impedance of N(+)N N(+) structures and on metal oxide semiconductor devices in high inversion. Dissert. Abstr.

N75-23331 North Carolina State Univ., Raleigh.
RELATIONSHIP BETWEEN SURFACE RESISTANCE OF COPPER AND SURFACE ROUGHNESS AT MILLIMETER WAVELENGTHS Ph.D. Thesis
Fereydoun Jalali 1974 113 p
Avail: Univ. Microfilms Order No. 75-10380

The effect of the surface roughness on the conduction losses was investigated by measuring and evaluating the Q-values of a rectangular cavity resonator for various degrees of surface roughness of its side walls at 35 GHz. The rectangular cavity was optimized for the measurements and the sources of spurious losses were identified and the associated errors determined. Consideration was given to errors caused by gaps at the wall joints of the cavity and by the coupling elements. Errors were reduced by modification of cavity design, measurement procedure, and sample preparation. One-directional roughness was generated by grinding the side walls on selected abrasive papers and was measured by a profilometer calibrated using photomicrographs of surface profiles with well-defined roughnesses. Dissert. Abstr.

N75-23332 Purdue Univ., Lafayette, Ind.
CHARACTERIZATION AND MODELING OF CARRIER GENERATION IN CHARGE-COUPLED DEVICES OPERATED AT LOW FREQUENCY Ph.D. Thesis
Dewitt Gan Ong 1974 155 p
Avail: Univ. Microfilms Order No. 75-10934

A model was constructed for the thermal generation of carriers inside a charge-coupled device shift register. From a detailed analysis of one shift register bit, it is concluded that the surface generation in the signal carrying electrode is completely quenched. Bulk and surface generation of the other electrodes in the bit form a constant current feeding the signal carrying electrode. The analysis then generalizes into one for a metal oxide semiconductor capacitor with substantial lateral current. The study of the response is facilitated with an expression for the signal charge density as an implicit function of time. Thermal generation kan be observed to occur in two modes of operation. In the integration mode where the clock is stopped for hundreds of milliseconds, the device is in a quasi-steady state and steady state equations can be used. In the low frequency mode where the device is continuously clocked, but at a low frequency, the device stays in a transient condition. Dissert. Abstr.

N75-23333 Lehigh Univ., Bethlehem, Pa.
GENERALIZED PLANE PROBLEMS OF AN ELASTIC INCLUSION IN AN ANISOTROPIC MEDIUM Ph.D. Thesis
Hsueh-Cheng Yang 1974 127 p
Avail: Univ. Microfilms Order No. 75-10377

The generalized plane problem of an elastic inclusion in an infinite elastic medium with the most general anisotropy (in which no symmetry elements are assumed) is formulated. Detailed formulation is given for an elliptic inclusion. The stresses in the elliptic inclusion are found to be uniform, which enables the study of the perturbation effects of an elliptic inhomogeneity to an otherwise uniform stress field. Strain energy is considered. Explicit solutions of compact form were obtained for the plane strain problems in an orthotropic medium. The perturbations of an elliptic cavity and a rigid elliptic inhomogeneity to an otherwise uniform stress field are given. The anti-plane strain problem of an elliptic inclusion in an anisotropic medium with one plane of symmetry was solved. A computer program was developed to calculate and plot the orientation dependence of the increase of the elastic energy due to the presence of an elliptic elastic inhomogeneity in a crystal with constant surface tractions at infinity. Dissert. Abstr.

N75-23334 Illinois Univ., Urbana.
THEORY AND EXPERIMENTS ON HIGH FREQUENCY METAL OXIDE SEMICONDUCTOR CAPACITANCE Ph.D. Thesis
Michael John McNutt 1974 99 p
Avail: Univ. Microfilms Order No. 75-11694

The effect of the spatial distribution of the minority carriers at the surface of a strongly inverted semiconductor on the surface space charge layer capacitance is reviewed, and equivalent circuits and differential equations were obtained to characterize this effect. Analyses of the input admittances based on the transmission line or differential equation approaches show a 5% increase in the asymptotic capacitance in strong inversion over that obtained neglecting the minority carriers, and a 1% capacitance minimum in the capacitance-voltage curve near the onset of strong inversion. A simplified two lump equivalent circuit model was obtained which explicitly illustrates the physics of the strong inversion capacitance, and provides a formula which gives results within 0.4% of the exact solution. Expressions, including the effects due to impurity deionization and carrier degeneracy, were developed to extrapolate the oxide capacitance. The effect of areal oxide charge inhomogeneity on the MOS capacitance-voltage characteristics is considered. Dissert. Abstr.

N75-23335 Illinois Univ., Urbana.
ELECTRONIC CONDUCTION IN THALLIC OXIDE Ph.D. Thesis
Vishwa Nath Shukla 1974 208 p
Avail: Univ. Microfilms Order No. 75-11560

Electrical conductivity, Hall, and thermoelectric power measurements were made on single crystals of thallic oxide grown from the vapor, using the Piper and Polich technique. The crystals were annealed at different oxygen pressures ranging from 0.01 to 1 atm, at 650 C. The electrical conductivity and Hall measurements were carried out on oxygen annealed crystals from room temperature to liquid helium temperature. Under normal conditions thallic oxide was found to be a degenerate n-type semiconductor. The Hall mobility and electrical resistivity were strongly dominated by scattering from the ionized defects at low temperatures and acoustical lattice scattering at high temperatures. The Hall coefficient was found to be independent of temperature, magnetic field, and crystal orientations, suggesting electronic conduction in a simple s-like band. Thallic oxide was found to be diamagnetic from room temperature to liquid helium temperature. Dissert. Abstr.

N75-23336 Brown Univ., Providence, R.I.
A STUDY OF QUANTUM EFFECTS IN P-TYPE INVERSION LAYERS Ph.D. Thesis
Amir A. Lakhani 1974 133 p
Avail: NTIS Avail: Univ. Microfilms Order No. 75-9195

Holes in the inversion layers of Si at liquid helium range of temperatures and under high magnetic field were studied. Under magnetic fields greater than 40 kOe oscillations in the channel conductivity were observed. The number of carriers per Landau

level was found to be independent of the order of the Landau level. Also the period of conductivity oscillations in gate voltage followed the cosine law when the sample was rotated in the magnetic field, and the degeneracy of the ground state subband was found to be two. The Dingle temperature as a function of the carrier concentration was measured and from it the carrier scattering time and mobility were deduced. The effective mass of holes was estimated from the dependences of the amplitude of Shubnikov de Haas oscillations on the temperature. Other features of the system, namely, the hot carrier effect, ionization of bound states, occupation of a higher subband, and an additional structure in the first two Landau levels are also discussed.
Dissert. Abstr.

N75-23337 California Inst. of Tech., Pasadena.
EQUILIBRIUM AND NON-EQUILIBRIUM SUPERCONDUCTING QUANTUM INTERFERENCE PHENOMENA, 1. APPLICATIONS OF SUPERCONDUCTING QUANTUM MAGNETOMETER, 2 Ph.D. Thesis
Run-Han Wang 1975 135 p
Avail: Univ. Microfilms Order No. 75-9543

A quantitative determination was made on the relaxation rate of a perturbed superconducting phase to relax back to its equilibrium state. The temperature-dependent relaxation time is found to be consistent with the known quasiparticle relaxation time in nonequilibrium superconductors. The effect of relaxation processes on macroscopic quantum interference phenomena was observed for the first time through the temperature modulation of quantum interference in multiply connected superconducting circuits, and implies a modification of the Josephson frequency-voltage relationship. A relaxation model was developed which accounted for nearly all the experimental results. The development and performance of an ultrasensitive superconducting magnetometer instrument based on various unique properties of superconductors are discussed. Applications of this instrument over a temperature range of 200 K in the fields of magnetochemistry, palemagnetism and the study of fluctuation effects in superconductivity are illustrated with actual data. Dissert. Abstr.

N75-23338 Brown Univ., Providence, R.I.
A STUDY OF PHONONS AND ELECTRON-PHONON INTERACTION IN TETRAHEDRAL SEMICONDUCTORS BY MEANS OF RAMAN SCATTERING Ph.D. Thesis
Bernard Allen Weinstein 1974 239 p
Avail: Univ. Microfilms Order No. 75-9265

Second order (two-phonon) Raman scattering in tetrahedral semiconductors was investigated. After a brief historical introduction and survey of the literature concerning two-phonon and resonance Raman scattering, the formal theory of the Raman effect was developed. Expressions for the first and second order Raman tensors were obtained in the single electron approximation; these expressions are shown to describe phonon induced changes (within the quasistatic approximation) in the electronic polarizability. The selection rules and symmetry properties of the Raman effect are discussed, and explicit expressions for the first and second order Raman tensors for Ge (zincblende) type materials in the vicinity of the E sub o-gap were obtained. Measurements of second order Raman scattering for Si, Ge, and GaP, including resonance effects for GaP, are presented. Dissert. Abstr.

N75-23339*# Wisconsin Univ., Madison. Theoretical Chemistry Inst.
EVALUATION OF LATTICE SUMS BY THE POISSON SUM FORMULA
Roger D. Ray 23 Jan. 1975 15 p refs
(Grants NGL-50-002-001; NSF GP-28213)
(NASA-CR-142702; WIS-TCI-525) Avail: NTIS CSCL 20L

The Poisson sum formula was applied to the problem of summing pairwise interactions between an observer molecule and a semi-infinite regular array of solid state molecules. The transformed sum is often much more rapidly convergent than the original sum, and forms a Fourier series in the solid surface coordinates. The method is applicable to a variety of solid state structures and functional forms of the pairwise potential. As an illustration of the method, the electric field above the (100) face of the CsCl structure is calculated and compared to earlier results obtained by direct summation. Author

N75-23340# Weapons Research Establishment, Salisbury (Australia).
THE COMPUTATION OF GROWTH CHARTS AND THE EFFECT OF LAYER THICKNESS VARIATIONS FOR THIN FILM INTERFERENCE FILTERS
M. S. Brown Dec. 1974 28 p refs
(WRE-TN-1311(AP)) Avail: NTIS HC $3.75

Modifications to a previously published computer program were made to aid in the design and manufacture of thin-film filters. The computation of growth charts which show how the spectral transmission of a thin film filter changes as the layer system is built up during manufacture are performed by one modification. The computation of the change in the spectral transmission of a filter as the thickness of any layer of the interference system is changed is performed by a second modification. Author

N75-23341# Northeastern Univ., Boston, Mass.
RETENTION OF METASTABLE GAMMA NEPTUNIUM AND EPSILON Pu ALLOYS AND STUDIES RELATIVE TO THEIR POSSIBLE SUPERCONDUCTIVITY AT LOW TEMPERATURES
H. H. Hill, R. O. Elliott, and B. C. Giessen Aug. 1974 5 p refs Presented at the Intern. Symp. on the Electron. Structure of the actinides, Argonne, Ill., 9 Oct. 1974 Sponsored by ERDA
(COO-3395-9; Conf-741057-2) Avail: NTIS HC $3.25

Metastable bcc gamma-Np and epsilon-Pu solid solution alloys were retained to room temperature by rapid quenching from the liquid state. Ga additions were employed to stabilize gamma-Np, Ti used to retain epsilon-Pu. To estimate possible superconducting transition temperatures for these phases of Np and Pu, Np and Pu were substituted for U in gamma-U alloys. Extrapolations to 100 at. % impurity concentrations indicated probable T sub s values of approximately 30 mK for gamma-Np and 2 mK for epsilon-Pu. The gamma-Np(GA) and epsilon-Pu(Ti) alloys were not superconducting above 0.5 K, as expected. Studies to lower temperatures are in preparation. Author (NSA)

N75-23342# California Inst. of Tech., Pasadena. W. M. Keck Lab. of Engineering Materials.
SUPERCONDUCTIVITY IN AMORPHOUS AND MICROCRYSTALLINE TRANSITION METAL ALLOYS
W. L. Johnson and S. J. Poon Sep. 1974 25 p refs
(Contract AT(04-3)-822)
(CALT-822-64) Avail: NTIS HC $3.25

Results of X-ray diffraction, electrical resistivity, critical magnetic field, and transport measurements for several bulk amorphous and microcrystalline transition metal superconductors obtained by liquid quenching are presented and discussed. Simple J sub c-Hc sub 2-T sub c relations are observed for this class of materials. A linear relation between electronic diffusivity and nearest neighbors distance is derived from critical field measurements. The relationships between the formation of an amorphous phase by rapid cooling from the liquid state, the lattice stability and the characteristics of phase diagrams are discussed.
Author (NSA)

N75-23343# University of Southern Calif., Los Angeles.
FOURIER-SPACE COMPUTER SIMULATION OF CRYSTALLINE IMPERFECTIONS, 3 Annual Progress Report, 1 Jan. - 31 Dec. 1974
D. DeFontaine Oct. 1974 32 p refs
(Contract AT(04-3)-34)
(UCLA-34P201X2; UCLA-ENG-7475; APR-3) Avail: NTIS HC $3.75

The Fourier transform method, used to describe detect or solute atom configurations in terms of concentration waves, is the basis for computer programs for calculating elastic interaction energies and atomic displacements of defect structures. Results were obtained for interaction energy calculations of defect clusters in the continuum limit. The existence of stable cluster configurations is demonstrated. The wave concept is particularly useful in kinetic studies. The mechanism of spinodal ordering is introduced to account for kinetics of partial ordering in the Ni-Mo system. Short range order dynamics are also studied by this method supplemented by group theoretic symmetry considerations. Symmetry rules in Fourier space are further used to classify

phase transformation and mechanisms. Time dependent perturbation theory, which is at the root of spinodal theory, is used to study possible oscillatory behavior of vacancy concentrations in irradiated materials. Author (NSA)

N75-23344# Battelle-Northwest, Richland, Wash.
HIGH-RATE SPUTTERING OF Nr-Al-Ge AND Nb-Al SUPERCONDUCTORS
S. D. Dahlgren 1974 14 p refs Presented at the Conf. on App. Superconductivity, Argonne, Ill., 30 Sep. 1974 Sponsored by ERDA
(BNWL-SA-5060; Conf-740950-1) Avail: NTIS HC $3.25

High quality Nb-Al-Ge and Nb-Al superconductor deposits were made at a rate of 1 micron/min using high rate sputtering techniques. Deposits were up to 1 mm thick. High rate sputtering reduced fabrication difficulties and significantly increased current capacities. Sputtering equipment capabilities indicate reasonable quantities of high field superconductors can be made by high rate sputtering for practical application. The Nb-Al-Ge and Nb-Al deposits were of high quality as indicated by highly reflective metallic mirror surfaces, even in thicknesses up to 1 mm. Moreover, the deposits were completely void-free and they did not seem to be overly brittle either before or after heat treatment. Crystal structures for deposits made at 10 C to 20 C were not clearly defined, but probably were body centered cubic (bcc). Heat treatment at 550 C to 850 C completely transformed the bcc deposits to extremely small grains of the A-15 crystal structure. The A-15 phase formed by heat treatment for short times at 750 C was metastable and supersaturated with Al and Ge.
Author (GRA)

N75-23345# Tennessee Univ., Knoxville. Dept. of Physics.
MOESSBAUER STUDIES OF DILUTE Ag : Fe AND Ag : Co ALLOYS
J. R. Thompson and J. O. Thomson 1974 6 p refs Presented at the 20th Ann. Conf. on Magnetism and Magnetic Mater., San Francisco, 3 Dec. 1974 Sponsored by ERDA
(Conf-741202-12) Avail: NTIS HC $3.25

The dilute Kondo alloys Ag-Fe-57 and Ag-Co-57 were studied via the Moessbauer effect at temperatures between 0.022 and 20K and in applied magnetic fields from 0 to 60 kG. This allows study of both the thermal and magnetic breakup of the nonmagnetic ground state. The higher temperature results are consistent with experimental results. As the temperature is lowered, a strong reduction from free spin behavior of the local moment is observed. At the lowest temperatures the dependence of the Fe hyperfine field, on applied field is compared with several theoretical and semiempirical expressions, where each describes the data moderately well, none with marked superiority. Also reported are the first measurements of the hyperfine field of Co-57 in Ag, obtained via the intensity asymmetry of the spectra. The field can be described in terms of a large positive Knight shift K = (28 + or - 8) percent. Author (NSA)

N75-23346# Brookhaven National Lab., Upton, N.Y.
INFLUENCE OF THE AMORPHOUS PHASE ON BORON ATOM DISTRIBUTIONS IN ION IMPLANTED SILICON
B. L. Crowder (IBM, Yorktown Heights, N. Y.), J. F. Ziegler (IBM, Yorktown Heights, N. Y.), and G. W. Cole 1972 10 p refs Presented at the 3rd Intern. Conf. on Ion Implanted in Semicond. and Other Mater., New York, 11 Dec. 1972 Sponsored by ERDA
(BNL-19089; Conf-721226-3) Avail: NTIS HC $3.25

The nuclear reaction B-10(n, 4He)Li-7 was used to investigate the B depth distribution obtained by ion implantation into crystalline Si in a random direction and into amorphous Si produced by Si ion bombardment. The presence of the amorphous phase before B ion implantation had a pronounced effect on the B depth distribution (i.e. implantation into misaligned crystalline Si was not equivalent to implantation into amorphous Si). The presence of an amorphous phase had a marked effect on the amount of diffusional broadening of the B distribution during annealing at 900 C. Author (NSA)

N75-23347# Brookhaven National Lab., Upton, N.Y.
FABRICATION AND PROPERTIES OF Nb3Sn SUPERCONDUCTORS BY THE SOLID DIFFUSION PROCESS
M. Suenaga, W. B. Sampson, and C. J. Klamut 30 Sep. 1974 7 p refs Presented at the Appl. Superconductivity Conf., Oakbrook, Ill., 30 Sep. 1974 Sponsored by ERDA
(BNL-19277; Conf-740957-24) Avail: NTIS HC $3.25

It is demonstrated that the superconducting compound Nb3Sn can be produced at the interface of Nb and Cu-Sn alloy when the composite is heat treated at the proper reaction temperature. This method of Nb3Sn preparation is shown to be particularly suited to the fabrication of (a) Nb3Sn multifilamentary composite wires for dc and low-frequency applications and (b) low ac loss Nb3Sn tapes for 60-Hz applications. The fabrication method and superconducting properties of Nb3Sn composite conductors made by this process are reviewed and the metallurgical aspects of the process are discussed. Since practical applications of these composites requires large, high-current conductors, methods of producing compound conductors such as cables and braided ribbons which include strengthening and stabilizing components are also discussed and some preliminary results of high-current conductors are presented. Author (NSA)

N75-23348# Brookhaven National Lab., Upton, N.Y.
COHERENT ac JOSEPHSON EFFECT IN A BULK GRANULAR SUPERCONDUCTING SYSTEM
M. L. Yu and A. M. Saxena 30 Sep. 1974 4 p refs Presented at the Appl. Superconductivity Conf., Oakbrook, Ill., 30 Sep. 1974 Sponsored by ERDA
(BNL-19284; Conf-740957-27) Avail: NTIS HC $3.25

A three dimensional close packed array of Josephson junctions was successfully produced in the form of a bulk granular superconductor. The granular system is a tightly compressed solid of oxide coated small tin particles in the thousand A range. The three dimensional array of Josephson junctions thus formed showed coherent Josephson oscillations when external RF radiation was imposed. RF induced constant voltage steps were observed on its I-V characteristics at voltages a few thousand times the Josephson voltage. The external RF radiation also induced stable dc voltages on unbiased bulk samples, suggesting a practical mode of microwave detection. The analogy of this bulk superconducting system with a magnetic spin system is discussed. Author (NSA)

N75-23349# Brookhaven National Lab., Upton, N.Y.
SELF-SYNCHRONOUS PARAMETRIC AMPLIFICATION USING JOSEPHSON JUNCTIONS
M. L. Yu 30 Aug. 1974 3 p refs Presented at the Appl. Superconductivity Conf., Oakbrook, Ill., 30 Sep. 1974 Sponsored by ERDA
(BNL-19283; Conf-740957-26) Avail: NTIS HC $3.25

A new way to use Josephson junctions for parametric amplification with phase control is proposed. The dc current bias of the junction was adjusted such that the Josephson oscillation automatically synchronizes with the input signal and oscillates at twice the signal frequency with the proper relative phase. The impedance of the junction has a negative resistive component which can be used for amplification. Extension to other phase sensitive circuits is also discussed. Author (NSA)

N75-23350# California Univ., Berkeley. Lawrence Berkeley Lab.
RELIABLE dc SQUID MADE WITH TUNNEL INJECTIONS
J. Clarke, W. M. Goubau, and M. B. Ketchen Oct. 1974 6 p refs Presented at Appl. Superconductivity Conf., Oakbrook Ill., 30 Sep. 1974
(Contract W-7405-eng-48)
(LBL-3191; Conf-740957-30) Avail: NTIS HC $3.25

The SQUIDS of cylindrical geometry were fabricated using Nb-NbO(x)-Pb tunnel junctions. The SQUIDS can be thermally cycled repeatedly and cooled in the earth's magnetic field without significant loss of performance. Flux resolution above a frequency of 1 Hz was achieved through optimization of electronic circuitry and careful shielding. Fluctuations and drift in the temperature of the helium bath are found to be the major source of long term SQUID noise. With a simple temperature stabilizer, drift was reduced to less than 0.00008 phi sub O/hr over a three hour period. Author (NSA)

N75-23351# California Univ., Berkeley. Lawrence Berkeley Lab.
LOW FREQUENCY NOISE IN JOSEPHSON JUNCTIONS

J. Clarke and G. Hawkins Oct. 1974 4 p refs Presented at Appl. Superconductivity Conf., Oakbrook, Ill., 30 Sep. 1974
(Contract W-7405-eng-48)
(LBL-3182) Avail: NTIS HC $3.25

Using a high resolution SQUID voltmeter, measurements were made of the spectrum of low freguency voltage fluctuations across a thin film Josephson tunnel junction biased at a constant current greater than the junction critical current. It was found that the frequency dependence of the voltage spectrum may be accurately represented by the power law over the frequency range of 0.01 < F < 10 Hz. The dependence of the magnitude of the spectra at any single frequency upon the value of the bias current and upon the sample temperature supports the hypothesis that the observed voltage fluctuations arise from a modulation of the junction critical current by equilibrium, thermodynamic temperature fluctuations in the active junction volume. Measurements were interpreted in terms of the semi-empirical theory of Clarke and Voss for the low frequency fluctuation spectrum of systems obeying a diffusion equation. This interpretation provides design criteria which may prove useful in reducing the level of long term drifts in systems employing Josephson tunnel junctions.
Author (NSA)

N75-23352# Sandia Labs., Albuquerque, N.Mex.
FILM THICKNESS MEASUREMENTS BY BETA RAY BACKSCATTERING TECHNIQUES
H. Fischer Aug. 1974 16 p refs Transl. into ENGLISH from proceedings of EPIC Conf. on Quality Control of PC Boards (Munich), 9 Nov. 1966 16 p Sponsored by ERDA
(SAND-74-8508; Conf-701158-1) Avail: NTIS

The technique and apparatus for measuring film thickness by the beta ray backscattering principle are described. NSA

N75-23353# Commissariat a l'Energie Atomique, Grenoble (France).
CONTRIBUTION TO THE STUDY OF EPITAXIAL SILICON FILM ON SAPPHIRE AND ACTIVE DEVICES REALIZATION Thesis
M. Garcia Oct. 1974 90 p refs In FRENCH
(CEA-R-4587) Avail: ERDA Depository Libraries HC $4.75

It is concluded from the physical analysis of the silicon epitaxial film study that high Al concentration is near the silicon-sapphire interface and near free silicon surface. Resistivity measurements imply that these impurities are in an inactive form and it is suggested that an AlxOy complex is present. The Si-SiO2 interface quality is seen to be as good on silicon-on-sapphire as on bulk wafers. An electrical analysis of the silicon film was studied from the measurement of minority carriers recombination rate at Si-sapphire interface on N-type silicon and show the leakage currents of P(+)N diodes are due to recombination at this interface. Diffusion length of minority carriers in N-type film was measured. Author (NSA)

N75-23354# Centre National de la Recherche Scientifique, Toulouse (France). Lab. d'Automatique et d'Analyse des Systemes.
STATIC AND DYNAMIC PROPERTIES OF DUAL GATE MOS TETRODES
P. Rossel and M. Belmas 1974 32 p refs Presented at the 4th European Solid State Device Res. Conf., Nottingham, Engl., 16-19 Sep. 1974
(LAAS-Publ-1189) Avail: NTIS HC $3.75

A method for characterization and computerized simulation of dual gate MOS tetrodes is presented taking into account the carrier mobility reduction under the action of electrical fields together with the effect of stray elements in the frequency behavior. The MOS tetrode being equivalent to two MOS transistors in cascade configuration and used in high frequency amplification was fabricated using planar technology. Two gate electrodes on an oxide layer of thickness between 300 and 2000 nanometers have distances between the diffusion varying between five to 10 microns. The width of the conducting zones are between 300 microns and a few millimeters, the static properties are detailed with regard to behavior equations, model parameters, and comparison between theory and experiment. The dynamic properties are described with regard to HF characteristics, characterization of stray elements, simulation model, and maximum available gain. ESRO

N75-23355# Office National d'Etudes et de Recherches Aerospatiales, Toulouse (France). Dept. d'Etudes et de Recherches en Technologie Spatiale.
PERFECTION OF A QUARTZ MONITOR. A CAROUSAL SYSTEM FOR SEMIINDUSTRIAL PRODUCTION OF UNIFORM THIN FILMS: APPLICATION TO D5A SOLAR ABSORBERS [MISE AU POINT D'UN ENSEMBLE BALANCE A QUARTZ. SYSTEME A CARROUSEL POUR LA FABRICATION SEMIINDUSTRIELLE DE COUCHES MINCES UNIFORMES: APPLICATION A D5A - ABSORBEURS SOLAIRES]
M. Soulet Nov. 1974 19 p In FRENCH
(ONERA-DERTS-NT-04-3) Avail: NTIS HC $3.25

A quartz oscillator monitored device is presented for semi-industrial production of vacuum deposited, uniform thin films to be used as solar energy absorbers for thermal control of the Frech D5A satellite. The existing equipment is reviewed and laboratory tests discussed with regard to adhesion, absorptance, and emission properties of the films made of Cr, Au, Al, SiO. The proposed improvements provide for enhanced reproducibility and homogeniety. The carousel device used for that purpose is described together with ancillary equipment. The calibrating procedure is detailed, and the final set up for the D5A satellite panels is presented. ESRO

N75-23356# Ohio State Univ., Columbus. Dept. of Mechanical Engineering.
THERMOELECTRIC MATERIALS AT 300K Final Report
R. DeVore, W. W. Anderson, J. W. Harpster, C. F. Sepsy, and D. E. Shapiro Jun. 1974 217 p refs
(Contract DAAK02-73-C-0435; OSURF Proj. 3714)
(AD-781545; Rept-3714-1) Avail: NTIS CSCL 20/12

The purpose of this study was to investigate the present possibilities for thermoelectric materials improvement and to determine a realistic least upper bound on the thermoelectric figure of merit (z). This study is restricted to materials used for Peltier cooling, and particularly those applicable to air conditioning applications. In a broader sense, fabrication and assembly technology were considered concurrently although the emphasis was placed upon the materials aspect. GRA

N75-23357# Massachusetts Inst. of Tech., Cambridge.
PHONON SPECTRUM AND STRONG-COUPLING SUPERCONDUCTIVITY IN Nb: A SINGLE-CRYSTAL TUNNELING STUDY
Kenneth K. Lo, Judith L. Bostock, Margaret L. A. MacVicar, and Robert M. Rose 21 Feb. 1975 158 p refs
(Contract N00014-67-A-0204-0041)
(AD-A006930; TR-11) Avail: NTIS CSCL 20/12

Superconducting tunneling junctions of single crystal Nb grown in ultrahigh vacuum by the electron beam floating zone technique have been fabricated with counterelectrodes of Au, In, and Pb. The tunneling characteristics are nearly ideal and uniformly yield a Nb energy gap value of 2 delta (0) - 3.12--/5 mV. The first and second derivatives of the I-V curves of these junctions are measured with a precision better than one part in 0.0001 at 0.9 K using an AC bridge circuit. This tunneling data is deconvoluted to give the electronic density of states, N(E) of superconducting Nb. Further, the experimental data is used to determine the electron-coupled phonon spectrum, (alpha squared) F, the electron-phonon coupling constant, lambda, and the dimensionless Coulomb pseudo-potential, mu*, characteristic of Nb. These parameters, as determined from each of 11 different junctions, are compared and discussed in relation to crystal orientation, resistivity ratio, sample fabrication, etc. Finally, the general character of the (alpha squared) F spectrum is discussed in relation to a lattice dynamics calculation and the neutron diffraction data of the Nb phonon spectrum, F(w). GRA

N75-23358# Rockwell International Corp., Thousand Oaks, Calif.
FREQUENCY DEPENDENT DIELECTRIC PROPERTIES OF LEAD-TIN-TELLURIDE Annual Report, 1 Apr. - 31 Dec. 1974
J. A. Cape and W. E. Tennant 31 Dec. 1974 38 p refs
(Contract N00014-74-C-0311)
(AD-A006968; SC590.5AR-1) Avail: NTIS HC $3.75 CSCL 20/12

The authors report on the use of reflectivity measurements

in the far infrared to obtain information on frequency and spatial dependence of the dielectric function of a Pb(0.82)Sn(0.18)Te epitaxial film. Reflectivity data were taken at near normal incidence from approximately 20/cm to 320/cm at 77K and at room temperature. The data consisted of the usual restrahl band plus a region of oscillations resulting from Fabry-Perot effect in the film and extending from approximately 120/cm to 320/cm. These oscillations provided that most abundant information on the dielectric function. The data were analyzed using the conventional two-oscillator dielectric function including phonon and plasma damping. The spatial dependence of the dielectric function associated with the film substrate interface was accounted for by allowing for spatial dependence of the plasma frequency omega sub p. Two four-parameter analytical functions and a simple step (three-parameter) function were used to mode omega sub p(x). GRA

N75-23359# Westinghouse Research Labs., Pittsburgh, Pa.
INVESTIGATION OF FLUX PINNING AND CRITICAL CURRENT DENSITIES IN TYPE 2 SUPERCONDUCTORS Technical Report, 30 Jun. 1974 - 30 Jan. 1975
Martin Ashkin, Anakkavur T. Santhanam, Mahendra P. Mathur, Daniel W. Deis, and David M. Moon 18 Feb. 1975 39 p refs
(Contract N00014-73-C-0026; NR Proj. 039-116)
(AD-A006743; Rept-75-9C31-FLPIN-R1-Rev; TR-3) Avail: NTIS CSCL 20/12

The relation between flux-pinning and microstructure has been established for Nb-25%Zr superconducting wires, cold worked and annealed between 600 and 700C. This treatment produces a recovery of the dislocation structure and the development of a cell structure but does not produce any detectable beta Zr precipitation. Optimum pinning as measured by the flux-pinning force density maximum results from a fine cell structure with the greatest structural difference between wall and interior. There is some indication that stronger pinning result from a higher initial level of cold work. Techniques for preparation of thin foils from longitudinal and transverse sections of multifilament superconductors for transmission electron microscopy have been developed. Longitudinal sections are prepared by first grinding the wire into a thin ribbon followed by electropolishing. Transverse sections are obtained after increasing the diameter at the conductor by copper plating. Large areas suitable for microscopy have been produced in multifilament niobium conductors with filament diameter of only 7 micrometers (0.00028 in). GRA

N75-23360# South Carolina Univ., Columbia. Coll. of Engineering.
INTERNATIONAL COMMITTEE ON SILICON CARBIDE Final Report, 20 Aug. 1970 - 30 Jun. 1974
J. W. Faust, Jr. 30 Nov. 1974 13 p
(Contract F19628-71-C-0033; AF Proj. 5620)
(AD-A006699; AFCRL-TR-74-0613) Avail: NTIS CSCL 20/12

The meetings of the International Committee on Silicon Carbide and the third International Conference on Silicon Carbide are discussed. GRA

N75-23361# Yeshiva Univ., New York. Belfer Graduate School of Science.
SYSTEMATIC STUDY OF PYROELECTRICITY. FERROELECTRICITY AND PYROELECTRICITY IN THE PEROVSKITES Interim Report, 1 Oct. 1973 - 30 Sep. 1974
M. I. Bell and P. M. Raccah Jan. 1975 44 p refs
(Contract DAAB07-74-C-0470; ARPA Order 2573)
(AD-A007147; ECOM-74-0470-1) Avail: NTIS CSCL 20/12

The relation between ferroelectricity and pyroelectricity in the perovskites is explored using Devonshires phenomenological theory of ferroelectricity and a new microscopic theory obtained by generalizing the conventional molecular field theory. The Devonshire formalism yields results for the pyroelectric coefficient and the figures of merit for pyroelectric detectors in terms of the parameters which characterize the dielectric behavior and the ferroelectric phase transition. A simple thermodynamic relation for the figure of merit is also derived. The molecular field theory is generalized in a novel way which permits it to describe first as well as second-order phase transitions. Good agreement with experiment is obtained for Bati O3. The new theory assumes the existence of a disordered array of dipoles in the perovskites, and evidence for this disorder is obtained from measurements of Raman scattering in KNb O3. GRA

N75-23362# Stanford Univ., Calif. Dept. of Physics.
MANY BODY PROBLEMS Final Report, 1 Apr. 1964 - 30 Sep. 1974
F. Bloch Dec. 1974 10 p refs
(Contracts N00014-67-A-0112-0047; Nonr-225(75))
(AD-A006593) Avail: NTIS CSCL 20/12

The research, carried out under the contract, was mostly directed towards the investigation of low-temperature phenomena, in particular superconductivity and superfluidity and the related problems of interacting Fermi- and Bose-systems. Several other investigations were carried out, however, during the first half of the contract period. Research in the following areas are discussed: Nonlinear optics; nuclear magnetic moments; correlation effects in conjugated molecules; superconductivity and interacting Fermi systems; superfluidity and interacting Bose systems. GRA

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

No abstracts in this category.

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

N75-23363# Joint Publications Research Service, Arlington, Va.
TRANSLATIONS ON EASTERN EUROPE: SCIENTIFIC AFFAIRS, NO. 462
25 Apr. 1975 39 p ref Transl. into ENGLISH from various East European reports
(JPRS-64632) Avail: NTIS HC $3.75

Articles concerning the development and progress in scientific and technical fields in East European countries are presented. For individual titles, see N75-23364 through N75-23366.

N75-23364 Joint Publications Research Service, Arlington, Va.
APPLICATION OF PERT METHODS DISCUSSED c81
Jerzy Wyszomirski *In its* Transl. on Eastern Europe: Sci. Affairs, No. 462 (JPRS-64632) 25 Apr. 1975 p 4-8 Transl. into ENGLISH from Informatyka (Warsaw), no. 1, Jan. 1975 p 21-22 (For availability see N75-23363 14-80)

The PERT (Program Evaluation and Review Technique) is applied to the construction of industrial machine plants and discussed in terms of cost. It is concluded that the method is cost effective. J.M.S.

N75-23365 Joint Publications Research Service, Arlington, Va.
INSUFFICIENT UTILIZATION OF SCIENTIFIC ADVANCES c81
Sergiu Tamas *In its* Transl. on Eastern Europe: Sci. Affairs, No. 462 (JPRS-64632) 25 Apr. 1975 p 9-18 Transl. into ENGLISH from ERA Socialista (Bucharest), no. 6, Mar. 1975 p 9-13 (For availability see N75-23363 14-80)

Sociopolitical and economic management is discussed in terms of the scientific and technological revolution in Romania. It is indicated that the efficiency of the economic and social processes must be increased. The following factors are discussed: reduction of resources, raw materials, and energy on a world-wide level, production based on biological procedures,

reduction of the research to production cycles, rise in labor productivity and reduction in consumption; and the principle of recycling. J.M.S.

N75-23366 Joint Publications Research Service, Arlington, Va.
USE OF HARD ALLOYS FOR METAL CUTTING AT THE CRAIOVA ELECTROPUTERE
M. Baltanoiu, S. Sontea, C. Chifu, Gh. Rusescu, and T. Combei *In its* Transl. on Eastern Europe: Sci. Affairs, No. 462 (JPRS-64632) 25 Apr. 1975 p 19-26 ref Transl. into ENGLISH from Constructia de Masini (Bucharest), Jan. 1975 p 16-19 (For availability see N75-23363 14-37)

Hard alloys are used in the form of cut metal plates for the processing of metals and nonmetalliferous substances such as plastics, stratified electrical insulating materials, and synthetic resins. Powders were studied and assimilated in the metallurgy laboratory for the purpose of standardization. Results are presented. Author

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N75-23367*# National Aeronautics and Space Administration, Washington, D.C.
HANDBOOK FOR PREPARATION OF WORK BREAKDOWN STRUCTURES
Feb. 1975 26 p
(NHB-5610.1) Avail: NTIS MF $2.25; SOD HC $0.80 CSCL 05A

Guidelines are presented for development of work breakdown structures (WBS) for NASA programs, projects, and contracts. The WBS were developed by starting with the end objective required and successively subdividing it into manageable components in terms of size and complexity, such as program, project, system, subsystems, components, tasks, subtasks, and work elements. M.J.S.

N75-23368 Colorado Univ., Boulder.
GAP THEORY: A VEHICLE MANAGEMENT TECHNIQUE FOR RESOLVING MERGE CONFLICTS IN PERSONAL RAPID TRANSIT SYSTEMS Ph.D. Thesis
Dennis Allen Gary 1974 330 p
Avail: Univ. Microfilms Order No. 75-3781

The theoretical analysis of gap motions along a linear section of a PRT guideway was dealt with. Each of the four basic gap motions is studied with respect to its implications on system variables such as energy consumption, customer service, and the maintenance of a safe operating headway. Then, the concept of a queue of gaps is introduced by a combined use of the storage and quasi-creation motions. Some applications of gap theory to PRT systems were also studied. In the simplest cases of local applications to a single guideway, analytical models based on queueing theory are developed. In more involved localized intersection applications, algorithms are provided for typical X-, symmetrical Y-, and unsymmetrical Y- intersections. Finally, a preliminary study of the application of gap theory to the proposed Denver PRT system leads to the conclusion that current technology severely limits the theory's practical use. Dissert.. Abstr.

N75-23369*# National Aeronautics and Space Administration, Washington, D.C.
STATEMENTS OF WORK HANDBOOK
Feb. 1975 28 p
(NHB-5600.2) Avail: NTIS MF $2.25; SOD HC $0.85 CSCL 05A

Guidelines are presented for preparing statements of work (SOW) to assure a consistent approach throughout NASA. Statements of work for study and preliminary definition contracts, for definition and development of major systems, for support services, and for small research and development contracts are discussed. M.J.S.

N75-23370# CACI, Inc., Arlington, Va.
NAVY MODIFIED LOGISTICS COMPOSITE MODEL (LCOM) USER'S MANUAL Final Report
Joyce D. Maillart and James H. Wilson Nov. 1974 174 p refs
(Contract N00019-75-C-0039)
(AD-A006975; CACI-R-7501) Avail: NTIS CSCL 15/5

Navy-Modified LCOM is a resource consumption/utilization analyzer which simulates dynamically the support operations of an aircraft carrier, air capable ship, or air base. In attempting to execute an input flying schedule, LCOM carries out maintenance, repair and servicing operations on the system's aircraft. LCOM is uniquely flexible. The necessary resources and the flow of operations are entirely declared and defined by the user's inputs. Thus, the analyst may make his model large or small, simple or complex. Essentially a discrete-event simulation, LCOM can be used to analyze any servicing complex, such as a hospital, motor pool, or job shop. The Navy-Modified LCOM User's Manual describes the model in detail, while providing input and run instructions as well as a sample problem. GRA

N75-23371# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE POSSIBILITIES AND LIMITATIONS OF PROGNOSTIC MODELING
L. Khotin 7 Jan. 1975 15 p Transl. into ENGLISH from the book "Sovet Ekonomicheskoi Vzaimopomoshchi. Postoyannaya Komissiya po Koordinatsii Nauchnykh i Tekhnicheskikh Issledovanii. Teoriya i Praktika Prognozirovaniys Razvitiya Nauki i Tekhniki v Stranakh-Chlenakh Sev" Moscow, IZD VO Ekonomika, 1971 p 143-147
(AD-A006844; FTD-HC-23-2346-74) Avail: NTIS CSCL 05/1

The theoretical premises for using modeling with an aim toward prognostication in different areas of science and technology are presented: (1) an informational approach to different physical systems, or informational modeling on the basis of volume analysis; (2) the control of currents of information in different physical systems, reflected in models which use an electronic computer; and (3) a collective transformation of currents of information and, correspondingly, a transformation of informational models on the basis of formalized methods. GRA

N75-23364 Joint Publications Research Service, Arlington, Va.
APPLICATION OF PERT METHODS DISCUSSED
Jerzy Wyszomirski *In its* Transl. on Eastern Europe: Sci. Affairs, No. 462 (JPRS-64632) 25 Apr. 1975 p 4-8 Transl. into ENGLISH from Informatyka (Warsaw), no. 1, Jan. 1975 p 21-22 (For availability see N75-23363 14-80)

N75-23365 Joint Publications Research Service, Arlington, Va.
INSUFFICIENT UTILIZATION OF SCIENTIFIC ADVANCES
Sergiu Tamas *In its* Transl. on Eastern Europe: Sci. Affairs, No. 462 (JPRS-64632) 25 Apr. 1975 p 9-18 Transl. into ENGLISH from ERA Socialista (Bucharest), no. 6, Mar. 1975 p 9-13 (For availability see N75-23363 14-80)

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software*.

N75-23372# Advisory Group for Aerospace Research and Development, Paris (France).
NATIONAL AND INTERNATIONAL NETWORKS OF LIBRARIES, DOCUMENTATION AND INFORMATION CENTRES
Mar. 1975 82 p refs In ENGLISH; partly in FRENCH Presented at the Tech. Inform. Panel Specialists' Meeting, Brussels, 2-3 Oct. 1974
(AGARD-CP-158) Avail: NTIS HC $4.75

The interrogation and retrieval methodology, monodisciplinary and multidisciplinary, for designing multinational networks and

library systems as a function of user requirements are summarized. Data are also given on hardware and software problems and future trends in the field. For individual titles, see N75-23373 through N75-23382.

N75-23373 Liege Univ. (Belgium).
PROBLEMS OF A BIBLIOGRAPHIC NETWORK AND DOCUMENTATION CENTER IN BELGIUM [LES PROBLEMES DE RESEAUX POUR BIBLIOTHEQUES ET CENTRES DE DOCUMENTATION EN BELGIQUE]
Pierre-andre Piron *In* AGARD Natl. and Intern. Networks of Libraries, Doc. and Inform. Centres Mar. 1975 6 p refs In FRENCH; ENGLISH summary (For availability see N75-23372 14-82)

A Governmental committee on scientific policy has undertaken to promote the optimization of some library and documentation activities by networking. Three projects were outlined. Share cataloguing between scientific libraries (such as the Royal Library and Universities), union catalog of the same institutions, information retrieval from bibliographic data bases of international interest. Proposals were made for building up a wide network linking documentation centers throughout the country. Author

N75-23374 Statskontoret, Stockholm (Sweden).
A DATA NETWORK IN THE DOCUMENTATION AND LIBRARY AREA
Rolf Andren *In* AGARD Natl. and Intern. Networks of Libraries, Doc. and Inform. Centres Mar. 1975 5 p (For availability see N75-23372 14-82)

The Swedish Agency for Administrative Development, SAFAD, is developing an experimental network to be used by different education and research institutes to access information retrieval and library systems located at different places. The basic principle is that it shall be possible to communicate with several data bases through one network from one terminal. The network contains functions that make it possible to connect different kinds of terminals, e. g. teletype and various CRT terminals. The users are primarily the Swedish university libraries and the first data bases to be connected are the LIBRIS, the MEDLINE and the ESRO SDS data banks. Operation was started in spring 1974 but before a decision to build out the network is taken, an evaluation will be made of system performance before May 1975. Author

N75-23375 Defense Documentation Center, Alexandria, Va.
LINKING US/DOD AND OTHER SCIENTIFIC/TECHNICAL ON-LINE SYSTEMS
Hubert E. Sauter *In* AGARD Natl. and Intern. Networks of Libraries, Doc. and Inform. Centres Mar. 1975 13 p refs (For availability see N75-23372 14-82)

Several different types of networks will be examined as well as work experiences with them. The concepts and alternative methods for interlinking networks will be described, particularly the rationale for interfacing several networks in the future. An outline of expected benefits to the research community will be given, including suggested actions that might be initiated to develop cooperative networks. Author

N75-23376 Computer Aided Design Centre, Cambridge (England).
DATA BANKS AND NETWORKS FOR ENGINEERING DESIGN PURPOSES
G. C. Freeman *In* AGARD Natl. and Intern. Networks of Libraries, Doc. and Inform. Centres Mar. 1975 6 p refs (For availability see N75-23372 14-82)

Special problems of CAD are discussed and data indicate that because of the hierarchical nature of integrated design systems the local data base will also be hierarchical in structure. Communications with other systems via a computer network make it desirable that application programs and data bases should not be inextricably linked. Such a policy would ensure maximum flexibility, making possible economies of scale through the sharing of expertise and software that could then take place. Author

N75-23377 British Library, London (England). Research and Development Dept.
AN APPROACH TO THE DEVELOPMENT OF LIBRARY AND INFORMATION NETWORKS WITH SPECIAL REFERENCE TO THE UK
P. L. Holmes *In* AGARD Natl. and Intern. Network of Libraries, Doc. and Inform. Centres Mar. 1975 7 p refs (For availability see N75-23372 14-82)

The need for careful preparation and planning of library and information networks is discussed, and the British Library research program explained. Three parallel phases, concerned with assessment of existing on-line bibliographic information services, provision of data for planning of a library and information network in the UK, and examination of computing, telecommunication, and reprographic techniques for their applications to information-handling, are covered. Author

N75-23378 European Space Research Organization, Frascati (Italy). Space Documentation Service.
ON-LINE NETWORKING BETWEEN INFORMATION CENTRES IN EUROPE
D. M. Audsley *In* AGARD Natl. and Intern. Networks of Libraries, Doc. and Inform. Centres Mar. 1975 12 p refs (For availability see N75-23372 14-82)

Future trends in on-line networking for information retrieval purposes and the possibilities of collaboration between networks in Europe are examined. The technical aspects of major on-line networks are mentioned. The development of a special purpose distributed European-wide information network is postulated. The need for extremely close and detailed levels of European coordination during the development and implementation of such a network is anticipated. The possible uses of communications satellites, in particular ESRO projects, are mentioned. Author

N75-23379 Commission of the European Communities, Luxembourg.
INTERNATIONAL NETWORKING: INFORMATION RETRIEVAL REQUIREMENTS
P. L. VanVelze and G. W. P. Davies *In* AGARD Natl. and Intern. Networks of Libraries, Doc. and Inform. Centres Mar. 1975 7 p (For availability see N75-23372 14-82)

A network for scientific and technical information is being developed for the European Community. The authors represent the Commission of the European Communities, which was charged with the task of coordinating the activities of Member Countries to work towards this common network. The main topics discussed are: the goals of the planned network, the project organization, the role of the telecommunications facilities and the factors which are influencing the design of the network. Author

N75-23380 Cegos-Tymshare, Saint Cloud (France).
THE TYMNET NETWORK [LE RESEAU TYMNET]
Michel Raclet *In* AGARD Natl. and Intern. Networks of Libraries, Doc. and Inform. Centres Mar. 1975 4 p refs In FRENCH (For availability see N75-23372 14-82)

A description is given of TYMNET, a time sharing telecommunication network utilized by small data processing centers. Data cover transmission, connection, and surveillance procedures. Network hardware and software are discussed along with advantages to small processing centers using the system.
Transl. by E.H.W.

N75-23381 Association of Special Libraries and Information Bureaux, London (England). Research and Development Dept.
USER REQUIREMENTS IN LIBRARIES, DOCUMENTATION AND INFORMATION CENTERS
Margaret Slater *In* AGARD Natl. and Intern. Networks of Libraries, Doc. and Inform. Centres Mar. 1975 4 p (For availability see N75-23372 14-82)

Surveys of user populations by questionnaire or interview are used with increasing frequency in an attempt to establish user requirements in libraries, documentation and information centres. Although the survey is a flexible and useful technique it does have intrinsic limitations, which do not seem to be fully recognized by all concerned in instigating, executing or interpreting user research in the defined field. A negative defense of the survey method is given. Data outline what the survey can not fairly be expected to accomplish, and indicate areas in which the proper sphere of application would seem to lie. Author

N75-23382 National Center for Scientific and Technical Documentation, Brussels (Belgium).

USER REQUIREMENTS: AUTOMATED SERVICES
Guy M. Vanautryve *In* AGARD Natl. and Intern. Networks of Libraries, Doc. and Inform. Centres Mar. 1975 6 p refs (For availability see N75-23372 14-82)

General user requirements and their effects on the design of automated services in information networks are examined. Data are given on quality control, system interaction, system management and system effectiveness. Author

N75-23383# Defence Scientific Information Service, Ottawa (Ontario).
A SUBJECT BIBLIOGRAPHY FOR LOW INTENSITY CONFLICT
R. B. Harvey and G. W. R. Graves Mar. 1975 42 p refs
(DSIS-TN-75-1) Avail: NTIS HC $3.75

A special bibliography in the subject area of Low Intensity Conflict (LIC) is described. This bibliography was compiled to test a subject classing and indexing schedule for LIC and for use as a reference tool for those working in the field. Material was selected from the Canadian Defence Scientific Information Service library of scientific and technical reports and by experts in the field. A schedule of subject category fields was used to class the selected bibliographic entries. Unclassified bibliographic material was published in one volume and classified material in a second one. Subject, author, and accession number indexes were included in each. Selection, classification, and publication are given. The category distribution of the bibliographic entries and the expected usefulness of the bibliography to a number of groups working in LIC are discussed. Topics requiring further investigation are noted. Author

N75-23384# European Association of Scientific Information Dissemination Centres, the Hague (Netherlands).
THE FUTURE OF CO-OPERATIVE INFORMATION PROCESSING IN EUROPE
B. Battrick, ed. Paris ESRO Aug. 1974 105 p refs Proc. of the European Assoc. of Sci. Inform. Dissemination Centres Conf., Frascati, Italy, 6-8 Dec. 1973
(ESRO-SP-102) Avail: NTIS HC $5.25

Twelve papers on the development of cooperation in information processing in Europe are presented. Topics dealt with include information planning and economic realities, social science documentation data bases, nuclear information, a cooperative chemical information project in the Netherlands, chemical information systems, information forecasts, cooperation in European networking, retrospective chemical searching, and a computer-based industrial information system. The resolution on information processing cooperation in Europe, as accepted by the Eusidic full members, is also presented. ESRO

N75-23385# Defense Documentation Center, Alexandria, Va.
BIBLIOGRAPHY OF BIBLIOGRAPHIES IN THE DDC COLLECTION Report Bibliography, Jan. - Nov. 1974
Mar. 1975 184 p refs
(AD-A006700; DDC-TAS-75-4) Avail: NTIS CSCL 05/2

The bibliography is a compilation of references which were processed into the DDC data bank. It contains 114 entries covering the period January 1974 through January 1975. These citations are arranged in the following 19 COSATI Subject Categories: Aeronautics; Atmospheric Sciences; Behavioral and Social Sciences; Biological and Medical Sciences; Chemistry; Earth Sciences and Oceanography; Electronics and Electrical Engineering; Energy Conversion (Non-propulsive); Materials; Mathematical Sciences; Mechanical, Industrial, Civil, and Marine Engineering; Methods and Equipment; Military Sciences; Navigation, Communications, Detection, and Countermeasures; Nuclear Science and Technology; Ordnance; Physics; Propulsion and Fuels; and Space Technology. Corporate Author-Monitoring Agency, Subject, Title, Personal Author, Contract, and Report Number Indexes are included. GRA

N75-23386# Informatics, Inc., Rockville, Md.
SOVRAD: A DIGEST OF RECENT SOVIET R AND D ARTICLES. VOLUME 1, NUMBER 2, 1975
S. Hibben, L. Boylan, J. Kourilo, and B. Shresta Feb. 1975 17 p refs
(Contract N00600-75-C-0018; DARPA Order 2790)
(AD-A006931) Avail: NTIS CSCL 05/2

This is a collection of brief abstracts on miscellaneous topics from the current Soviet technical literature. Topics covered are the following: underwater optics, acoustic holography, laser theory, geophysics, material science, and magnetohydrodynamics. GRA

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

N75-23387# RAND Corp., Santa Monica, Calif.
PROTECTING THE US PETROLEUM MARKET AGAINST FUTURE DENIALS OF IMPORTS Interim Report
Horst Mendershausen and Richard Nehring Oct. 1974 108 p
(Contract DAHC15-73-C-0181)
(AD-A006643; R-1603-ARPA) Avail: NTIS CSCL 05/3

The report considers precautionary policies to counter the threat of future disruptions in the supply of U.S. oil imports. Such disruptions are highly possible, since the conditions that produced the Arab embargo of 1973-74 have not been eliminated. The authors review the recent oil embargo and U.S. responses to it, examine the history of U.S. petroleum imports, and weigh the outlook for future imports by source and relative vulnerability. GRA

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

N75-23388# Committee on Aeronautical and Space Sciences (U. S. Senate).
NASA AUTHORIZATION FOR FISCAL YEAR 1976 AND THE TRANSITION PERIOD, PART 3
Washington GPO 1975 746 p Hearings on S. 573 before Comm. on Aeron. and Space Sci., 94th Congr., 1st Sess., 3 and 11 Mar. 1975
(GPO-50-797) Avail: SOD HC $6.05

Various NASA Programs for the fiscal year 1976 are described. The following programs are included: pollution monitoring; earth resources survey program, technology for fuel conservation; weather and climate program; space processing; and technology for earth orbital transportation system. Illustrations are given. J.M.S.

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

N75-23389# Committee of the Whole House on the State of the Union (U. S. House).
PROPOSALS FOR IMPROVING NATION'S TRANSPORTATION
Richard Nixon Washington GPO 1974 40 p Message from the President of the United States to the 93d Congr., 2d Sess., 1974
(H-Rept-93-214; GPO-99-011) Avail: US Capitol, House Document Room

Proposals are presented for improving transportation systems in the United States together with a draft of proposed legislation to amend the Interstate Commerce Act. Topics discussed include compensatory rates, flexibility in establishing

rates, the abandonment of uneconomic rail lines, financing of rail transportation, rolling stock scheduling and control systems, and other amendments to other provisions of law to establish a unified transportation assistance program. M.J.S.

N75-23390# Nederlands Scheeps-Studiecentrum TNO, Delft. Scheepsbouw Afdeling.
PROGRESS AND DEVELOPMENTS OF OCEAN WEATHER ROUTING
C. DeWit (Delft Univ. of Technol., Neth.) Nov. 1974 25 p refs
(Rept-201-S; TDCK-65701) Avail: NTIS HC $3.25; Ned. Scheepsstudiecentrum TNO, Delft Dfl. 10

The present day possibilities of the ocean weather routing of merchant ships were investigated. To this end the feasibility of minimum time ship routing was studied, involving weather forecast uncertainties and ship performance data. The advantages of minimum time ship routing are indicated, including economic considerations and minimization of fuel consumption. The routing services that actually exist in the Netherlands, Germany, and Great Britain are compared. ESRO

N75-23391# Massachusetts Inst. of Tech., Cambridge. Energy Lab.
THE ROLE FOR FEDERAL R AND D ON ALTERNATIVE AUTOMOTIVE POWER SYSTEMS Interim Report, 1 Jun. - 31 Oct. 1974
John B. Heywood, Henry D. Jacoby, Lawrence H. Linden, Patricia D. Mooney, and Joe M. Rife Nov. 1974 175 p refs
(Grant NSF EN-44166)
(PB-238771/0; MIT-EL-74-013) Avail: NTIS HC $6.25 CSCL 21G

The question: Is it appropriate for the Federal Government to support R and D on alternative automotive power systems is examined. Potential alternatives to the internal combustion engine (ICE) include the stratified charge, Wankel, diesel, Rankine cycle, Stirling cycle, gas turbine, electric and hybrid systems. These engines may offer advantages over the ICE but considerable development would be required, and Federal support has been proposed. The five sections of the report are: a description of the central issue and a set of underlying issues, a review of the relevant technology, an exploration of the role for Federal R and D in overall Federal policy concerning the automobile, an analysis of present programs in industry and government, and conclusions. Appendices review the history of Federal programs and describe the content of present industry and government programs. GRA

N75-23392# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
EVALUATION OF THE ENERGY PERFECTION OF THE DIFFERENT FORMS OF TRANSPORT
A. A. Borin 18 Feb. 1975 29 p refs Transl. into ENGLISH from Uch. Zap. Tsentr. Aerogidrodinamicheskii Inst. (USSR), v. 2, no. 6, 1971 p 140-145
(AD-A006562; FTD-MT-24-0455-75) Avail: NTIS CSCL 20/11

Direct comparative evaluation of power engineering of transport vehicles is discussed which is based on different methods of lift formation and thrust. It is shown that the criteria of transport vehicles are divided into four categories characterized by different dependence of energy criterion on the motion speed. Other topics discussed include flow rates, hydrofoils, lift devices, air intakes, and cost analysis. M.J.S.

88 SPACE SCIENCES (GENERAL)

N75-23393# Arbeitsgemeinschaft fuer Weltraumforschung, Munich (West Germany).
HELIOS SATELLITE SCIENTIFIC DATA EVALUATION [PROJEKT HELIOS - SYMPOSIUM ZUR VORBEREITUNG DER WISSENSCHAFTLICHEN DATENAUSWERTUNG]
Herbert Porsche, comp. Bonn Bundesmin. fuer Forsch. u. Technol. Oct. 1974 200 p refs Partly in GERMAN; partly in ENGLISH Proc. of a Symp. held at Windberg, West Ger., 6-8 Feb. 1974 Sponsored by Bundesmin. fuer Forsch. U. Technol.
(BMFT-FB-W-74-08) Avail: NTIS HC $7.00; ZLDI, Munich DM 42.00

Possible contributions of the Helios experimental data to solar physics and knowledge of the interplanetary medium are reviewed. Topics considered are coronal electron density, gravitation theory, solar X-rays, solar wind, propagation in the interplanetary medium, and interplanetary dust measurements. For individual titles, see N75-23394 through N75-23409.

N75-23394 Bonn Univ. (West Germany). Inst. fuer Astronomie.
A COMMENT ON THE FARADAY-ROTATION EXPERIMENT **c92**
H. Volland *In* Arbeitsgemeinschaft fuer Weltraumforsch. Helios Satellite Sci. Data Evaluation Oct. 1974 p 9-11 refs (For availability see N75-23393 14-88)

Conditions under which the electron content can be determined within a plasma column along a linearly polarized electromagnetic wave propagating parallel to the magnetic field are discussed. The measurement of the polarization angle allows this determination, provided the magnetic field is known. Pioneer 6 experiments relating to the solar corona show that knowledge of the sector polarity of the interplanetary magnetic field (IPM) is a necessary condition. A correlation was discovered between the polarity of the IPM near the earth and geomagnetic variations observed within the polar cap. As geomagnetic variations at polar stations are continuously recorded, in situ measurements of the IPM onboard of Helios should resolve the problem of uniqueness of the Faraday rotation experiment. ESRO

N75-23395 Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Flugfunk und Mikrowellen.
DETERMINATION OF THE CORONAL ELECTRON DENSITY DISTRIBUTION FROM RANGE AND RANGE RATE DATA DURING SOLAR OCCULTATIONS OF THE HELIOS SPACECRAFT **c92**
P. Edenhofer *In* Arbeitsgemeinschaft fuer Weltraumforsch. Helios Satellite Sci. Data Evaluation Oct. 1974 p 12-14 (For availability see N75-23393 14-88)

A passive Helios experiment for determining coronal electron density distribution is described. Radial electron density distribution can be determined from time delay effects of Helios tracking data during occultation, and angular distribution from occultation data when the line of sight between Helios and earth is tangential to the trajectory of the spacecraft. Requirements regarding tracking of this experiment, and data release, are summarized. ESRO

N75-23396 Hamburg Univ. (West Germany). Lehrstuhl fuer Theoretische Physik.
THE HELIOS EXPERIMENT ON THEORIES OF GRAVITATION **c13**
W. Kundt *In* Arbeitsgemeinschaft fuer Weltraumforsch. Helios Satellite Sci. Data Evaluation Oct. 1974 p 15-17 (For availability see N75-23393 14-88)

Experiment 11 of Helios A measuring return time and polarization of an S-band radio signal is described. The experiment deals with the orbit of the spacecraft in the gravitational field of the sun, the planets, and the moon. In first approximation, this orbit is a Keplerian ellipse perturbed by the near planets. In second approximation, further perturbations occur, such as corrections to Newton's theory and the quadrupole moment of an oblate sun. The latter perturbations are the objective of the experiment. Accelerations, due to solar and planetary attraction and repulsion, as well as radiation reactions, are listed. ESRO

N75-23397 Hamburg Univ. (West Germany). Lehrstuhl fuer Theoretische Physik.
HELIOS PERTURBATIONS **c13**
W. Kundt *In* Arbeitsgemeinschaft fuer Weltraumforsch. Helios Satellite Sci. Data Evaluation Oct. 1974 p 18-22 (For availability see N75-23393 14-88)
Avail: NTIS

The parameters for a perturbation model of the Helios A orbit are summarized. The two classes of perturbations involved are: class 1, which can be determined independently from tracking;

and class 2, which can only be modeled analytically with an accurate knowledge of all the parameters in the model. Formulas for class 2 perturbations and related parameters are presented in tabular form. ESRO

N75-23398 Tubingen Univ. (West Germany). Lehrstuhl fuer Theoretische Astrophysik.
CONNECTIONS BETWEEN THE HELIOS X-RAY MEASUREMENTS AND OTHER OBSERVATIONS c92
G. Elwert *In* Arbeitsgemeinschaft fuer Weltraumforsch. Helios Satellite Sci. Data Evaluation Oct. 1974 p 23-29 refs (For availability see N75-23393 14-88)

A few points relating to Helios solar X-ray observations are discussed in conjunction with planned sounding rocket experiments. ESRO

N75-23399 Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestrische Physik.
RADIAL GRADIENTS IN SOLAR WIND PLASMA c92
Rainer Schwenn *In* Arbeitsgemeinschaft fuer Weltraumforsch. Helios Satellite Sci. Data Evaluation Oct. 1974 p 30-40 (For availability see N75-23393 14-88)

The Helios experiment 1 is described, and possible applications to radial solar wind velocity gradient measurements are indicated. This experiment measures ion and electron velocity spectra of the solar wind plasma. The usefulness of line-up of other active interplanetary spacecraft with intact plasma instruments for correlation purposes is discussed. It should be possible to determine the radial gradient of the solar wind azimuthal velocity, the corotation of the solar wind, since the ratio between the bulk velocity and the azimuthal velocity is lower than at the earth's orbit. ESRO

N75-23400 Max-Planck-Institut fuer Extraterrestrische Physik, Garching (West Germany).
CHEMICAL COMPOSITION OF THE SOLAR WIND (MEASUREMENT POSSIBILITIES OF THE PLASMA EXPERIMENT OF THE HELIOS PROBE) [DIE CHEMISCHE ZUSAMMENSETZUNG DES SOLAREN WINDES (MESSMOEGLICHKEITEN DES PLASMA-EXPERIMENTS AUF DER SONDE HELIOS)] c92
H. Miggenrieder *In* Arbeitsgemeinschaft fuer Weltraumforsch. Helios Satellite Sci. Data Evaluation Oct. 1974 p 41-51 refs In GERMAN (For availability see N75-23393 14-88)

The possible objectives of heavy ion observation in the solar wind and the measurement possibilities of the Helios plasma experiment are discussed. The unintentional recording of heavy ions can be made useful for several reasons, among which the knowledge of transport phenomena between photosphere and corona. The possibility is considered of three dimensional measurement of the solar wind spectrum with the 15-channel mass spectrometer, and also the temperature of heavy ions. ESRO

N75-23401 Technische Universitaet, Brunswick (West Germany). Lehrstuhl B fuer Theoretische Physik.
SOLAR WIND INTERACTION WITH THE HELIOS SPACE PROBE AND RELATED PERTURBATIONS OF LOW ENERGY PARTICLE SPECTRA c92
B. Koenemann, G.-H. Voigt, H. Schroeder, and U. Isensee *In* Arbeitsgemeinschaft fuer Weltraumforsch. Helios Satellite Sci. Data Evaluation Oct. 1974 p 52-97 refs (For availability see N75-23393 14-88)

The perturbations of the undisturbed solar wind, caused by the Helios spacecraft, are summarized. The spacecraft will be charged by photon and particle interaction, and the resulting electric potential distribution around the spacecraft affects the low energy particle spectra to be measured. The following perturbation mechanisms must be taken into account for evaluation of the plasma data: (1) the photoelectron sheath in front of the sunlit side of the satellite, (2) the potential of the negative wake behind the satellite, (3) the distinction between potentials which are due to conducting and non-conducting surface elements of the spacecraft, and (4) the satellite's surface potential depending on capacitor effects. Some simplified models are proposed and discussed in order to overcome these complex problems in a mathematically convenient way. Particle spectra modified by disturbing model potentials are computed. Author (ESRO)

N75-23402 Kiel Univ. (West Germany). Inst. fuer Reine und Angewandte Kernphysik.
PROPAGATION OF ALFVEN WAVES IN THE INHOMOGENEOUS INTERPLANETARY MEDIUM c92
Arne K. Richter *In* Arbeitsgemeinschaft fuer Weltraumforsch. Helios Satellite Sci. Data Evaluation Oct. 1974 p 98-112 refs Sponsored by Deut. Forschungsgemeinschaft (For availability see N75-23393 14-88)

Since the Helios probe makes it possible to identify Alfven waves close to the sun, the radial dependence of Alfvenic induced magnetic fluctuations can be investigated. A simplified Alfven wave propagation model is proposed, and the equations of motion are derived. The propagation was studied for an axisymmetric solar wind, as well as an azimuthally dependent solar wind. As the occurrence of high speed solar wind streams and of interplanetary propagating Alfven waves does not depend very strongly on the solar cycle, interacting solar wind configurations with Alfvenic induced, azimuthally distributed magnetic fluctuations will be observed during the mission of Helios. As this spacecraft will observe the solar wind plasma and the interplanetary magnetic field on a smaller time scale and closer to the sun, these observations may provide a better insight to the models discussed. ESRO

N75-23403 Kiel Univ. (West Germany). Inst. fuer Reine und Angewandte Kernphysik.
HELIOS EXPERIMENT NO. 6: DESCRIPTION IN TABLES c92
H. Kunow, G. Green, M. Witte, R. Mueller-Mellin, and H. Hempe *In* Arbeitsgemeinschaft fuer Weltraumforsch. Helios Satellite Sci. Data Evaluation Oct. 1974 p 113-119 In GERMAN and ENGLISH (For availability see N75-23393 14-88)

Details on Helios experiment no. 6, silicon radiation detectors, are presented in tabular form. ESRO

N75-23404 Kiel Univ. (West Germany). Inst. fuer Reine und Angewandte Kernphysik.
SEPARATION OF SOLAR AND INTERPLANETARY TRANSPORT PROCESSES FOR FLARE ACCELERATED PARTICLES c92
R. Reinhard and G. Wibberenz *In* Arbeitsgemeinschaft fuer Weltraumforsch. Helios Satellite Sci. Data Evaluation Oct. 1974 p 120-142 refs (For availability see N75-23393 14-88)

The azimuthal propagation of solar flare accelerated particles is considered. In particular, the question as to whether this propagation takes place close to the sun or in the interplanetary medium is discussed. On the basis of recent measurements it is concluded that the propagation does not take place in the interplanetary medium, and the only reasonable alternative is close to the sun, probably in the corona. The existence of two different flare particle propagation modes on the sun (fast propagation in the initial phase, slow drift and diffusion outside the fast propagation region) need to be further substantiated using satellite observations. ESRO

N75-23405 Kiel Univ. (West Germany). Inst. fuer Reine und Angewandte Kernphysik.
THE INFLUENCE OF FINITE INJECTION PERIODS ON ANISOTROPIES DURING SOLAR PARTICLE EVENTS c92
B.-M. Schulze, A. K. Richter, and G. Wibberenz *In* Arbeitsgemeinschaft fuer Weltraumforsch. Helios Satellite Sci. Data Evaluation Oct. 1974 p 143-158 refs Sponsored in part by Deut. Forschungsgemeinschaft (For availability see N75-23393 14-88)

The propagation of solar cosmic rays in interplanetary space is treated in terms of the diffusion theory and by considering a finite, but Gaussian, injection of these particles near the sun. The theory is applicable to the initial phase of a solar event and to times shortly beyond time-of-maximum (tm). A model was developed based on the equations of motion. The results were tested by fitting the intensity and anisotropy profile of the 21.5-60 MeV protons of the November 18, 1968, solar flare event recorded by Pioneer 9 in order to find out the best parameter combination. The calculated intensity profiles matching the observed ones, it is concluded that for one real particle event both intensity and anisotropy measurements plus higher values of the diffusion anisotropy even beyond tm can still be understood in terms of an improved diffusion model when a more realistic,

long lasting but finite injection of particles near the sun is additionally taken into account. ESRO

N75-23406 Ruhr Univ., Bochum (West Germany). Bereich Extraterrestrische Physik.
LIGHT PRESSURE ON HOMOGENEOUS AND INHOMOGENEOUS SPHERES **c90**
G. Schwehm *In* Arbeitsgemeinschaft fuer Weltraumforsch. Helios Satellite Sci. Data Evaluation Oct. 1974 p 161-169 refs (For availability see N75-23393 14-88)

The orbits of interplanetary dust particles, detected by micrometeoroid analyzers flown on space probes, were recalculated in order to determine the spatial distribution and dynamics of the interplanetary dust cloud. The gravitational attraction of the sun, as well as sunlight pressure was considered in the calculation. Results are presented in graphical form for homogeneous and inhomogeneous (mantle-core) particles. ESRO

N75-23407 Max-Planck-Institut fuer Astronomie, Heidelberg (West Germany).
SPATIAL DISTRIBUTION AND SCATTERING PROPERTIES OF INTERPLANETARY DUST DERIVED FROM ZODIACAL LIGHT OBSERVATIONS **c90**
C. Leinert *In* Arbeitsgemeinschaft fuer Weltraumforsch. Helios Satellite Sci. Data Evaluation Oct. 1974 p 170-174 refs (For availability see N75-23393 14-88)

An interpretation is given of the intensity and polarization, as a function of the angular distance to the sun, of the average zodiacal light with reference to the visual wavelength band. ESRO

N75-23408 Max-Planck-Institut fuer Kernphysik, Heidelberg (West Germany).
COSMIC DUST MEASUREMENT BY SPACE PROBE EXPERIMENTS **c90**
E. Gruen, H. Fechtig, P. Gammelin, and J. Kissel *In* Arbeitsgemeinschaft fuer Weltraumforsch. Helios Satellite Sci. Data Evaluation Oct. 1974 p 175-194 refs (For availability see N75-23393 14-88)

The present knowledge of the initial distribution of micrometeoroids provided by space probes is discussed. Dust measurements onboard Mariner 4, Pioneer 8 and 9, HEOS-2, and Pioneer 10 are reviewed. The distribution of cosmic dust is found to be varying in time, anisotropic, and of complicated spatial structure. Author (ESRO)

N75-23409 Max-Planck-Institut fuer Kernphysik, Heidelberg (West Germany).
MICROCRATERS ON LUNAR SAMPLES **c91**
H. Fechtig, W. Gentner, J. B. Hartung, K. Nagel, G. Neukum, E. Schneider, and D. Storzer *In* Arbeitsgemeinschaft fuer Weltraumforsch. Helios Satellite Sci. Data Evaluation Oct. 1974 p 195-200 refs (For availability see N75-23393 14-88)

The principal phenomenology of microcraters resulting from hypervelocity impacts of interplanetary particles on lunar rock surfaces is outlined. Investigations are reported in the fields of crater statistics, laboratory cratering experiments, solar flare track exposure ages, calculations of interplanetary dust fluxes, and erosion processes. ESRO

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N75-23410 Washington Univ., St. Louis, Mo.
ASTRONOMICAL FAR INFRARED SKY SURVEY Ph.D. Thesis
John Henry Goebel 1974 223 p
Avail: Univ. Microfilms Order No. 75-6596

The instrumentation is described which was used in the results obtained by a survey of the celestial sphere from a high altitude balloon-borne far infrared telescope. Approximately one-half of the sky was examined in the waveband 50-500 microns and with a lower detectable limit of radiation flux. Topics discussed include the rationale of a survey in the far infrared, the design of the telescope used, the far infrared detectors in which new results regarding the maximization of the parameters determining sensitivity are presented, devices determining the orientation of the telescope (magnetometer, shaft encoder, and sky cameras), the calculation of celestial coordinates for observational events, the validity of the observations and the criterion of reproducibility, possible sources or error in the experiment, and possible radiation emission mechanisms. Dissert. Abstr.

N75-23411 California Univ., Santa Cruz.
NEW PROPER MOTIONS, STATISTICAL PARALLAXES, AND KINETICS OF PLANETARY NEBULAE Ph.D. Thesis
Kyle McCabe Cudworth 1974 51 p
Avail: Univ. Microfilms Order No. 75-5502

Proper motions were measured for 51 planetary nebulae. These were combined with motions previously available and used in statistical parallax calculations. The distance scale thus calibrated for optically thin nebulae agrees with that of Seaton. For optically thick nebulae the mean nebular absolute magnitude is Mn = -2.0. The distance scales are the same for both Greig's classes. The kinematic difference between these classes is confirmed but the younger class is not concentrated in spiral arms. The kinematics of both classes are consistent with their being the offspring of Mira variables. The nebulae of brightest absolute magnitude are not those of highest surface brightness. This violates a basic assumption of Seaton and thus invalidates his recalibration of the distance scale. The nebular absolute magnitudes are most consistent with a nebular evolutionary track which loops upwards with the optically thick to thin transition occurring before the nebula reaches the peak of the track. Dissert. Abstr.

N75-23412 Maryland Univ., College Park.
INVESTIGATION OF THE SPIRAL STRUCTURE OF THE CRUX-CENTAURUS, CIRCINUS-NORMA REGION OF THE MILKY WAY BY MEANS OF LONG-PERIOD CEPHEIDS Ph.D. Thesis
Edwin John Grayzeck, Jr. 1974 259 p
Avail: Univ. Microfilms Order No. 75-7327

A search for faint undetected Cepheids was conducted. A number of new variables were found including four long-period classical Cepheids. Ultraviolet-Blue-Visible photoelectric and spectrographic observations were obtained for the new Cepheids, as well as 19 previously known Cepheids. Parameters of the Cepheid light and color curves were found and distances to the stars were estimated. Normal velocities were derived from a total of 121 spectra. A series of 21-cm line profiles was obtained in the approximate direction of each Cepheid with a measured normal velocity. The velocities of these stars show large deviations from circular motion. A tentative model is presented to describe the spiral structure in this region and, in particular, to trace out the spiral arm seen tangentially. Dissert. Abstr.

N75-23413 Northwestern Univ., Evanston, Ill.
RAPID VARIATION OF BALMER LINE STRENGTHS IN THE SPECTRA OF Be STARS Ph.D. Thesis
Kenneth Bruce McBeath 1974 95 p
Avail: Univ. Microfilms Order No. 75-7953

Low resolution photoelectric spectrophotometric measurements of the first four members of the Balmer series in the spectra of one Be and five Be (shell) stars were obtained with the 92-cm telescope and image dissecting scanner at Kitt Peak National Observatory in October, 1972. H alpha and H delta were observed simultaneously on two consecutive nights, while H delta and H gamma were also observed simultaneously one night before and one night after the H alpha and H delta measurements. The time resolution was on the order of one minute, and observations for each star extended continuously over a one to two hour interval. Equivalent widths were computed for each observation and their standard deviations from the mean values examined by comparing them to the standard deviations for chosen comparison B stars. Results indicate that in three of the program stars, at least one of the Balmer lines shows fluctuations in equivalent width sufficiently greater than those of the standards to be considered real. Dissert. Abstr.

N75-23414 Maryland Univ., College Park.
METER-WAVELENGTH OBSERVATIONS OF PULSARS USING VERY-LONG-BASELINE INTERFEROMETRY Ph.D. Thesis
Nancy Ruth Vandenberg 1974 201 p
Avail: Univ. Microfilms Order No. 75-7371

The results are presented of an investigation of the angular structure imposed on pulsar radiation due to scattering in the interstellar medium. The technique of very-long-baseline interferometry (VLBI) was used to obtain the necessary high angular resolution (approximately 0.1 arcsec). The interferometers formed by the Arecibo (305 m), NRAO (92 m), and Sugar Grove (46 m) telescopes were used at radio frequencies of 196, 111, and 74 MHz during seven separate observing sessions between 1971 November and 1973 February.The observations were concentrated on the Crab nebula pulsar (PSR 0531 + 21), and several strong, low-dispersion pulsars were also observed. A crude visibility function for the Crab nebular pulsar was obtained during a 144-MHz VLBI experiment in 1971 March. It is consistent with a Gaussian brightness distribution having a half-power diameter of 0.05 + or - 0.03 arcsec. Since only a small range of points in the (u,v) plane was sampled in the later experiment, the fringe visibilities were interpreted in terms of a Gaussian model. Dissert. Abstr.

N75-23415 California Univ., Santa Cruz.
A STUDY OF THE SPECTRUM AND COLORS OF R COR BOR AT MINIMUM LIGHT Ph.D. Thesis
Neelamraju Kameswara Rao 1974 80 p
Avail: Univ. Microfilms Order No. 75-7020

The spectrum and colors of the 1962 minimum of R CrB were studied using the scanner energy distributions obtained at 1972 and 1974 minima. The effects of the presence of emission lines in the energy distributions were corrected using the spectra obtained in 1962. The energy distribution becomes redder in the minimum. Mie scattering calculations were performed with graphite particles of different sizes to match the extinction curves obtained at minimum. The scans obtained in 1972 minimum from the time the star was at V = 11.6 on the decline to the return to maximum brightness, do not show any change in the mean size of the dust particles. The extinction curve obtained at V = 10.7 on the decline in 1974 shows smaller mean particle size. This combined with the appearance of scattering redshifts of absorption lines at V = 10.1 seems to indicate a growth in particle size. Dissert. Abstr.

N75-23416 California Univ., Los Angeles.
AN INVESTIGATION OF ECLIPSING BINARY STARS EXHIBITING CALCIUM 2 EMISSION Ph.D. Thesis
John Parker Oliver 1974 329 p
Avail: Univ. Microfilms Order No. 75-9422

Three color photometry of some eclipsing binaries showing calcium II emission is reported. A highly stable and accurate dc amplifier, and a new type digital averaging system are described. Past and current light curves of SS Boo, RS CVn, WY Cnc, WW Dra, UV Psc, Z Her, SS Cam, RW UMa, AR Lac, and RT Lac are discussed with particular emphasis on asymmetries in the heights of the maxima and variations in the depths of the minima. Both RS CVn and SS Boo show nearly sinusoidal variation outside eclipse. In these and other systems, the color changes accompanying the light variations suggest that the color star is responsible. Spectra of SS Boo and RS CVn are discussed with emphasis on the relationship between the spectral variations and the photometric variations. The suggestion is made that many of these systems belong to a new category of variable eclipsing binary star. Dissert. Abstr.

N75-23417 California Inst. of Tech., Pasadena.
SPECTROPHOTOMETRY OF SUPERNOVAE AND THEIR REMNANTS Ph.D. Thesis
Robert Paul Kirshner 1975 149 p
Avail: Univ. Microfilms Order No. 75-9530

Spectrophotometry of extragalactic supernova shortly after discovery, and of galactic supernova remnants was used to derive the masses, temperatures, compositions, and distances of supernovae. The Crab Nebula is shown to have a mass of ionized hydrogen in excess of 0.3 solar mass, but no enrichment of oxygen, nitrogen, or sulfur. The Cygnus Loop is shown to emit Fe(XIV), indicating gas at 2,000,000K; this establishes the thermal nature of the X-ray emission, and casts doubt on the Loop's size and distance. Type II supernovae are shown to be consistent with a few solar masses of material at cosmic abundance. Their distances are found without reference to any other astronomical distance through a model of the expansion. Type I supernovae are shown to consist of about 1 solar mass of matter that may be 20 times enriched in iron, if the identification of Fe(II) lines at late stages is correct. Dissert. Abstr.

N75-23418 California Univ., Santa Cruz.
METAL ABUNDANCES OF RR LYRAE STARS IN GALACTIC GLOBULAR CLUSTERS Ph.D. Thesis
Dennis Samuel Butler 1974 100 p
Avail: Univ. Microfilms Order No. 75-8473

Image-tube scanner measurements of Preston's metal abundance indicator were made for 47 RR Lyrae stars in 12 galactic globular clusters, and for 67 field RR Lyraes. Another index, which is a measure of metallic-line absorption in the region of the G-band, was also determined. There were thirteen field RR Lyraes analyzed for curve-of-growth. Calibration and values of Fe/H were deduced for the globular-cluster RR Lyraes. The problem of the anomalous horizontal-branch distribution functions in M13 and NGC 7006 is discussed. It is suggested that differences in the location of the horizontal branch in clusters with the same Fe/H result from different degrees of mixing between the envelope and hydrogen-burning shell in the horizontal-branch progenitor. Dissert. Abstr.

N75-23419 California Univ., Santa Cruz.
SPECTROPHOTOMETRY OF LOW REDSHIFT QUASI-STELLAR OBJECTS Ph.D. Thesis
Jack Allen Baldwin 1974 101 p
Avail: Univ. Microfilms Order No. 75-8471

Emission line strengths, line profiles, and continuum energy distributions were measured for fourteen quasi-stellar objects with redshifts $z < 0.3$. Most of these quasi-stellar objects have very broad permitted-emission lines and narrower forbidden-emission lines. It is argued that the broad and narrow emission lines originate in different regions of the gas. The broad line profiles are in good agreement with electron scattering profiles in most cases. There appears to be competition between electron scattering and Doppler broadening for the role of the predominant broadening mechanism. The Balmer decrements are found to be fairly steep and appear to rule out pure collisional excitations. It is suggested that very large photon densities in the far ultraviolet may seriously alter the forbidden line strengths. Dissert. Abstr.

N75-23420*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SMALL ASTRONOMY PAYLOADS FOR SPACELAB
Ralph C. Bohlin, ed. 1975 98 p Workshop held at Greenbelt, Md., 13-14 Feb. 1975 Submitted for publication
(NASA-TM-X-70882; X-692-75-91) Avail: NTIS HC $4.75 CSCL 03A

The workshop to define feasible concepts in the UV-optical 1R area for Astronomy Spacelab Payloads is reported. Payloads proposed include: high resolution spectrograph, Schmidt camera spectrograph, UV telescope, and small infrared cryogenic telescope. F.O.S.

N75-23421*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SAS-2 HIGH ENERGY GAMMA-RAY OBSERVATIONS OF THE VELA PULSAR
D. J. Thompson, C. E. Fichtel, D. A. Kniffen, and H. B. Oegelman Apr. 1975 14 p refs Submitted for publication
(NASA-TM-X-70877; X-662-75-102) Avail: NTIS HC $3.25 CSCL 03A

The second Small Astronomy Satellite high-energy (>35 MeV) gamma-ray telescope detected pulsed gamma-ray emission at the radio period from PSR 0833-45, the Vela pulsar, as well as an unpulsed flux from the Vela region. The pulsed emission consists of two peaks, one following the radio peak by about 13 msec, and the other 0.4 period after the first. The luminosity of the pulsed emission above 100 MeV from Vela is about 0.1 that of the pulsar NP0532 in the Crab nebula, whereas the pulsed emission from Vela at optical wavelengths is less than

0.0004 that from the Crab. The relatively high intensity of the pulsed gamma-ray emission and the double peak structure, compared to the single pulse in the radio emission, suggests that the high energy gamma-ray pulsar emission may be produced under different conditions from those found at lower energies. Author

N75-23422# European Southern Observatory, Hamburg (West Germany).
[RESEARCH ACTIVITIES OF THE EUROPEAN SOUTHERN OBSERVATORY] Annual Report, 1973
[1974] 90 p refs
Avail: NTIS HC $4.75

Brief reports on the libraries and meteorological activities are presented. The ESO 3.6 m telescope is described, noting such aspects as domes, air conditioning, design studies, optics, and instrumentation. The Schmidt and other telescopes are also described. The ESO sky survey project is mentioned, and the building and grounds together with other administration matters are discussed. ESRO

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N75-23423 California Univ., Los Angeles.
A TWENTY-ONE CENTIMETER APERTURE SYNTHESIS STUDY OF THE SMALL-SCALE STRUCTURE OF THE INTERSTELLAR MEDIUM Ph.D. Thesis
Denis Anthony Elliott 1974 417 p
Avail: Univ. Microfilms Order No. 75-5708

The technique of aperture synthesis was used to obtain complete, unambiguous maps of Cassiopeia A and Cygnus A. Both sources were observed at two well-separated velocity ranges, enabling material in both the Perseus and local spiral arms to be seen. The resulting maps of optical depth in the 21-cm line as a function of velocity were used to study the physical properties of the interstellar medium at linear size scales much smaller than have been available previously. It was found that in most cases, the gas shows considerable structure down to a limit of approximately one parsec. Except for a limited zone in the Perseus arm in the direction of Cas A, significant structure on a smaller scale is not seen. More clouds of smaller size appeared than was previously thought. Strong evidence for the two-phase model of the interstellar medium was obtained. Author

N75-23424 Massachusetts Univ., Amherst.
MODELS OF SATURN'S RINGS WHICH SATISFY THE OPTICAL AND INFRARED OBSERVATIONS Ph.D. Thesis
Yoshiyuki Kawata 1974 137 p refs
Avail: Univ. Microfilms Order No. 75-6277

Models of Saturn's rings were investigated which included a shadowing mechanism, realistic phase functions for the individual ring particles, and the effects of multiple scattering and a particle size dispersion. The effects due to the finite size of the sun, including the penumbra, are included in the shadowing mechanism. The basic model parameters are limited by the requirement that the absolute brightness of the rings, the variation of brightness with tilt angle (declination of the sun with respect to the ring plane), and the spectra of the rings agree with observation. The resulting models are considered in relation to the infrared and radar data which are now becoming available. In the calculation of the infrared temperature of the rings, the effect of mutual heating among the ring particles is considered quantitatively. Conclusions of the investigation are presented. Dissert. Abstr.

N75-23425 Case Western Reserve Univ., Cleveland, Ohio.
THE SPACE DENSITY AND KINEMATICS OF DWARF M STARS Ph.D. Thesis
William George Smethells 1974 109 p
Avail: Univ. Microfilms Order No. 75-5089

The results of an objective-prism survey for dwarf stars, K7 and later, are presented. One hundred twenty-one red sensitive plates covering 1720 sq. degrees of the southern sky were obtained with the Curtis Schmidt telescope at C.T.I.O. The resulting luminosity function rises from log N + 10 = 7.9 at M sub V = 8 to about 8.7 at M sub V = 11 and 12. About 75% of the dwarfs in this survey are identified with BPM stars, but inserting the proper motions given into the equations of the method of mean absolute magnitudes yields values of M sub B about three magnitudes brighter than the spectral types would indicate. That the method of mean absolute magnitudes appears to be calibrated on stars of higher than average proper motion lends credence to the luminosity function result. A galactic mass density is found for the dwarfs considered. Dissert. Abstr.

N75-23426 New Mexico Univ., Albuquerque.
GENERAL GEODESIC MOTION IN THE EXTENDED KERR MANIFOLD Ph.D. Thesis
Richard Heyden St. John 1974 90 p
Avail: Univ. Microfilms Order No. 75-6977

The timelike and null geodesics in the Kerr metric describe important properties of the space surrounding a rotating black hole. The general characteristics of these geodesics, with an emphasis on those on the axis of symmetry and the equatorial plane, are presented. On the axis of symmetry, the behavior of all timelike and null geodesics is completely described. The accessibility of various spaces added for geodesic completeness in the extended manifold is found by making local observations of geodesics in one coordinate patch from geodesics in another. Analysis shows that there is geodesic motion on the equatorial plane that is unstable in the theta direction. This instability is most pronounced for all zero angular momentum unbound orbits; in this case, there is no minimum or maximum theta, and any perturbation could carry the geodesic to the axis of symmetry. Dissert. Abstr.

N75-23427 California Univ., Santa Cruz.
GAS FLOW IN CATACLYSMIC VARIABLE STARS Ph.D. Thesis
Brian Paul Flannery 1974 93 p
Avail: Univ. Microfilms Order No. 75-8474

A hydrodynamic scheme for numerically simulating gas flow in binary stars is presented. The method includes both gravitational and pressure forces, and allows for shock formation and radiative cooling. Mass transfer originating from thermal evaporation through the inner Lagrangian point was studied in a binary system scaled to resemble the dwarf nova Z Cam. The gas flow was followed for a total time of 1.25 binary orbital periods. The dissipative effect of radiative cooling in shocks results in the rapid formation of a ring in direct rotation around the component receiving mass. Also, an optically thick, relatively confined shock front forms at the intersection of the ring and the stream from the Lagrangian point. The shock's temperature, 23000 K at maximum, and location confirm the major elements of the hot spot model proposed to account for observations of cataclysmic variable stars. Dissert. Abstr.

N75-23428 Columbia Univ., New York.
A NON-LINEAR MODEL FOR THE INTENSITY, LINEWIDTH, AND COHERENCE OF ASTROPHYSICAL MASERS Ph.D. Thesis
Richard Alan Rosen 1974 104 p
Avail: Univ. Microfilms Order No. 75-7530

The effect of pumping on the steady state coherent loss-less light wave trains which can propagate through a two-level resonant medium is studied. This phenomenon is a form of self-induced transparency. It is shown that for certain kinds of pumping this problem can be solved by assuming slowly varying parameters for the elliptic functions which describe the non-pumped steady state solutions. The resulting energy density and linewidth of the coherent radiation when Doppler broadening predominates grows asymptotically. The wave train evolves into a train of more and more distinct pulses. These results are applied to astrophysical clouds from which masing is observed, and it is shown that present observations are consistent with the form of coherent radiation predicted by the model described above. Dissert. Abstr.

N75-23429 California Univ., Santa Cruz.
CHEMICAL ABUNDANCES AND PHYSICAL CONDITIONS IN PLANETARY NEBULAE Ph.D. Thesis
Philip Timothy Barker 1974 117 p

Avail: Univ. Microfilms Order No. 75-8472

Photoelectric scanner observations were made of selected emission line intensities between 3400 A and 7400 A in thirty planetary nebulae. The nebulae were selected for extreme age, distance from the center of the galaxy, abnormal chemical abundances, and peculiar spectra. The electron temperatures and densities implied by different forbidden line intensity ratios are shown to agree well for most nebulae. Temperatures determined from forbidden lines are in agreement with those derived from the Balmer continuum. The relative abundances of H, He, Ne, O, and, less reliably, N and S, were determined for the thirty planetaries and for several planetaries observed previously.

Dissert. Abstr.

N75-23430 California Inst. of Tech., Pasadena.
H I OBSERVATIONS OF DUST CLOUDS Ph.D. Thesis
Kwong Wah Chu 1975 127 p
Avail: Univ. Microfilms Order No. 75-9520

Aperture synthesis observations of three dust clouds, L134, L1495 and L1517, were made at 21 cm. A 7 arc min diameter beam was synthesized, and the velocity resolution was 0.2 km/sec. In addition to interferometer observations, single dish measurements were carried out to provide large scale information. Two dust clouds, L134 and L1495, were detected in absorption against background 21 cm emission. In both cases the 21 cm absorption line is at a velocity coincident with molecular lines detected in the dust clouds. The hydrogen responsible for the absorption line has a spin temperature less than 20 K, and the columnar atomic hydrogen density through the dust clouds is between 10 to the 19th power/sq cm and 10 to the 20th power/sq cm. Based upon optical extinction and normal cosmic abundances, the expected hydrogen content is 10 to the 22nd power/sq cm. It is presumed that most of the hydrogen is in molecular form.

Dissert. Abstr.

N75-23431*# Kanner (Leo) Associates, Redwood City, Calif.
SUDDEN DAY LENGTH VARIATIONS IN JANUARY 1974
M. Feissel and B. Quinot Washington NASA May 1975 6 p refs Transl. into ENGLISH from Compt. Rend., Ser. B-Sci. Physiques, (Paris), v. 278, 1974 p 293-294
(Contract NASw-2481)
(NASA-TT-F-16363) Avail: NTIS HC $3.25 CSCL 03B

Space probe measurement of a reduction in the day length of approximately 0.001 sec for the early weeks of 1974 are discussed. This perturbation, the most abrupt occurrence ever measured, and its possible causes were examined. Author

N75-23432# Oak Ridge National Lab., Tenn.
USE OF SUPERNOVAE LIGHT CURVES FOR TESTING THE EXPANSION HYPOTHESIS AND OTHER COSMOLOGICAL RELATIONS Ph.D. Thesis
B. W. Rust Dec. 1974 400 p refs
(Contract W-7405-eng-26)
(ORNL-4953) Avail: NTIS HC $10.25

The expanding universe hypothesis was put to an observational test by using light curves for 37 supernovae. A value of H = 92/km/sec/M sub pc was obtained for the Hubble constant. NSA

N75-23433# Owens Valley Radio Observatory, Pasadena, Calif.
OBSERVATIONS WITH A VLB ARRAY. 2: THE SOURCES 4C39.25, NRAO150, VRO42.11.01, 3C345, AND 3C454.3, 342
D. B. Shaffer, M. H. Cohen, J. D. Romney, R. T. Schilizzi, K. I. Kellerman, G. W. Swenson, Jr., J. L. Yen, and R. Rinehart 1975 25 p refs
(Contract N00014-67-A-0094-0019; Grants NSF GP-30400-X1; NSF GP-8115)
(AD-A006637; Rept-1975-5) Avail: NTIS CSCL 03/2

Three-antenna long baseline interferometry at 10.7 GHz is reported for NRAO150, 4C39.25, 3C345, VRO42.22.01, and 3C454.3 for several epochs between April, 1972 and February, 1974. Simple models for the source brightness distributions fit the observations and indicate that most of the radio emission comes from one or two components. Component separations range up to approximately 50 light years, and component sizes are on the order of 10 light years. Small variations in source structure have been observed. GRA

N75-23406 Ruhr Univ., Bochum (West Germany). Bereich Extraterrestrische Physik.
LIGHT PRESSURE ON HOMOGENEOUS AND INHOMOGENEOUS SPHERES
G. Schwehm *In* Arbeitsgemeinschaft fuer Weltraumforsch. Helios Satellite Sci. Data Evaluation Oct. 1974 p 161-169 refs (For availability see N75-23393 14-88)

N75-23407 Max-Planck-Institut fuer Astronomie, Heidelberg (West Germany).
SPATIAL DISTRIBUTION AND SCATTERING PROPERTIES OF INTERPLANETARY DUST DERIVED FROM ZODIACAL LIGHT OBSERVATIONS
C. Leinert *In* Arbeitsgemeinschaft fuer Weltraumforsch. Helios Satellite Sci. Data Evaluation Oct. 1974 p 170-174 refs (For availability see N75-23393 14-88)

N75-23408 Max-Planck-Institut fuer Kernphysik, Heidelberg (West Germany).
COSMIC DUST MEASUREMENT BY SPACE PROBE EXPERIMENTS
E. Gruen, H. Fechtig, P. Gammelin, and J. Kissel *In* Arbeitsgemeinschaft fuer Weltraumforsch. Helios Satellite Sci. Data Evaluation Oct. 1974 p 175-194 refs (For availability see N75-23393 14-88)

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights.

For spacecraft design see *18 Spacecraft Design Testing, and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

N75-23434 Washington Univ., St. Louis, Mo.
THE PARTICLE TRACK RECORD IN LUNAR SILICATES: LONG-TERM BEHAVIOR OF SOLAR AND GALACTIC VH NUCLEI AND LUNAR SURFACE DYNAMICS
Donald Eugene Yuhas 1974 282 p

Stored nuclear particle tracks are abundant in all major mineral phases found on the moon. The track production in the near surface regions is dominated by VH cosmic rays of solar origin. At deeper depths heavy galactic cosmic rays dominate the production. The track profile (track density vs depth) is shaped by both the energy spectrum of impinging nuclei and dynamical processes which change rock surfaces with time. The analyses of track records in a number of lunar rocks with different surface exposure histories yield information about both dynamical processes on the moon and the long-term time behavior of solar and galactic cosmic rays. The depth dependence of fossil tracks in a particularly favorable lunar rock (68815) was used to derive an empirical track production energy spectrum suitable for calculating track exposure ages in lunar materials for depths greater than 1 mm. Dissert. Abstr.

N75-23435 Drexel Univ., Philadelphia, Pa.
AN EXPERIMENTAL MODEL OF THE ASTEROID/METEOROID ENVIRONMENT FROM 1.0 TO 3.5 AU: ITS CHARACTERISTICS AND IMPLICATIONS Ph.D. Thesis
Sherman Lester Neste 1975 184 p
Avail: Univ. Microfilms Order No. 75-6118

A brief historical summary of the techniques and instrumentation employed to investigate the interplanetary particulate environment is given. The environmental models which resulted from these investigations are presented to provide a basis for discussing the results of measurements made from the Pioneer 10 spacecraft by the asteroid meteoroid detector (AMD). The AMD detects and measures interplanetary particles by sensing the sunlight reflected from them as they pass through the instrument's overlapping optical fields-of-view. The concepts and engineering characteristics of the AMD necessary to understand the analysis of the measurements are presented. The results and conclusions of the analysis are based on the first in situ measurements of this type conducted in the interplanetary region beyond the orbit

of Mars. The spatial concentration and size distribution for particulates measured by the asteroid/meteoroid detector on Pioneer 10 between 1.0 and 3.5 astronomical units are presented. Dissert. Abstr.

N75-23436 Indiana Univ., Bloomington.
A PHOTOMETRIC STUDY OF PLUTO AND SATELLITES OF THE OUTER PLANETS Ph.D. Thesis
Leif Erland Andersson 1974 268 p
Avail: Univ. Microfilms Order No. 75-8968

Magnitudes and colors on the ultraviolet-blue-visible system were obtained for Pluto and twelve satellites of Jupiter, Saturn, Uranus, and Neptune. Phase coefficients and rotational light variations were also observed for most of the objects. Some applications of the theory of spin evolution by tidal friction are given; the time scale for despinning from an assumed primordial rotation period of 9(h) is calculated for the satellites in the solar system. Dissert. Abstr.

N75-23437 + Institut d'Aeronomie Spatiale de Belgique, Brussels.
BIBLIOGRAPHY. PART 11 1974. 2. INTERPLANETARY SPACE [BIBLIOGRAPHIE. FASCICULE 11 1974. 2. ESPACE INTERPLANETAIRE]
1974 118 p refs In FRENCH and ENGLISH
Avail: NTIS HC $5.25

A bibliography is presented on the subject of interplanetary space. Topics covered include the Moon, Venus, Mars, other planets, comets and meteorites, cosmic rays, gravity, the structure of interplanetary space, Kohoutek comet, planetary atmospheres, and interplanetary magnetic fields. M.J.S.

N75-23438 + Institut d'Aeronomie Spatiale de Belgique, Brussels.
BIBLIOGRAPHY. PART 12 A 1974. 1. TERRESTRIAL SPACE [BIBLIOGRAPHIE. FASCICULE 12 B 1974. 1. ESPACE TERRESTRE]
1974 114 p refs In FRENCH and ENGLISH
Avail: NTIS HC $5.25

A bibliography is presented on the subject of terrestrial space. Topics covered include solar rays, electromagnetic rays, solar activity, cosmic rays, satellite orbits, orbital mechanics, gravitational potential, structure of the upper atmosphere, the chemosphere, homosphere, and the magnetosphere. M.J.S.

N75-23439 + Institut d'Aeronomie Spatiale de Belgique, Brussels.
BIBLIOGRAPHY. PART 12 B 1974. 1. TERRESTRIAL SPACE [BIBLIOGRAPHIE. FASCICULE 12 A 1974. 1. ESPACE TERRESTRE]
1974 157 p refs In FRENCH and ENGLISH
Avail: NTIS HC $6.25

A bibliography is presented on the topic of terrestrial space. Topics covered include meteorology, geomagnetism, auroras, airglow, the D, E, and F regions of the ionosphere, very low frequencies, whistlers, radio waves, electron density profiles, and electron energy. M.J.S.

N75-23440*# California Inst. of Tech., Pasadena. Div. of Geological and Planetary Sciences.
MEASUREMENT OF THE LUNAR NEUTRON DENSITY PROFILE
Dorothy S. Woolum (California State Univ., Fullerton), D. S. Burnett, Marian Furst, and J. R. Weiss [1974] 45 p refs
(Contract NAS9-12585; Grant NsG-07023)
(NASA-CR-141782; Contrib-2539) Avail: NTIS HC $3.75 CSCL 03B

An in situ measurement of the lunar neutron density from 20 to 400 g/sq cm depth between the lunar surface was made by the Apollo 17 Lunar Neutron Probe Experiment using particle tracks produced by the B10(n, alpha)Li7 reaction. Both the absolute magnitude and depth profile of the neutron density are in good agreement with past theoretical calculations. The effect of cadmium absorption on the neutron density and in the relative Sm149 to Gd157 capture rates obtained experimentally implies that the true lunar Gd157 capture rate is about one half of that calculated theoretically. Author

N75-23441*# Kanner (Leo) Associates, Redwood City, Calif.
PROCESSING OF THE RESULTS OF THE RADAR MEASUREMENTS OF THE MARS FROM THE EARTH IN 1971, APPLICABLE TO THE PROBLEMS OF RADAR ALTIMETRY
N. N. Krupenio and V. A. Ladygin Washington NASA May 1975 39 p refs Transl. into ENGLISH from the mono. "Obrabotka Rezul'tatov Radiolakatsionnykh Izmereniy Marsa s Zemli v 1971 g. Primenitel'no k Zadacham Radiovysotometrii" Moscow, Academy of Sciences USSR, 1974 p 1-51
(Contract NASw-2481)
(NASA-TT-F-16294) Avail: NTIS HC $3.75 CSCL 03B

The specific effective scattering area at normal incidence, backscattering diagram widths, and coefficient of reflection of the surface layers of Mars were determined from the results of radar measurements of Mars from earth in 1971, at wavelengths of 3.8 and 12.5 cm. Tables and graphs are included. Author

N75-23442*# Kanner (Leo) Associates, Redwood City, Calif.
PROCESSING OF RADAR MEASUREMENTS OF MARS FROM THE EARTH IN 1971
N. N. Krupenio and V. A. Ladygin Washington NASA May 1975 23 p refs Transl. into ENGLISH from the mono. "Obrabotka Radiolokatsionnykh Izmereniy Mars Zemli v 1971 g." Moscow, Academy of Sciences USSR, 1974 p 1-54
(Contract NASw-2481)
(NASA-TT-F-16293) Avail: NTIS HC $3.25 CSCL 03B

Processed experimental data are presented for determination of the specific effective scattering area, coefficient of reflection, and backscattering diagram half-widths at the 0.1 and 0.5 levels (from data of radar measurements of Mars from earth in 1971, at wavelength of 12.5 cm). The calculation methods used are described. Author

N75-23443*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INTERPLANETARY MAGNETIC FIELDS, THEIR FLUCTUATIONS, AND COSMIC RAY VARIATIONS
E. Barouch and J. W. Sari (Calspan Corp.) Apr. 1975 20 p refs Submitted for publication
(NASA-TM-X-70881; X-692-75-85) Avail: NTIS HC $3.25 CSCL 03B

The cause of Forbush decreases is examined using neutron monitor data and measurements of the interplanetary magnetic field. It is found that for the period examined (Dec. 15, 1965 to April 23, 1966) large enhancements of the interplanetary magnetic field correlate well with decreases in cosmic ray intensity, while various parameters connected with the fluctuations in the field do not display such good correlation. The inference is drawn that Forbush decreases are not related to the turbulence or random motions in the field but to the large scale features of the field. Author

N75-23444*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
TEKTITES AND THEIR ORIGIN
John A. OKeefe [1975] 492 p refs
(NASA-TM-X-72543) Avail: NTIS HC $12.00 CSCL 08G

A study was conducted of the literature pertaining to the origin and characteristics of tektites. Topics discussed include tektite distribution in geographical locations, shapes of tektites, internal structure of tektites, physical properties, mechanical properties, optical properties, chemical composition, and comparisons with compositions of impact materials. Various arguments are presented on the terrestrial origin of tektites. It was found that some lunar craters of considerable size must be the products of volcanism which occurred during the past few million years, and that the moon must have within it a reservoir of rock which is considerably more like the mantle of the earth than like the rocks from which the basalts of the lunar crust are derived. M.J.S.

N75-23445*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE EFFECT OF A PLANETARY SURFACE PENETRATOR ON THE SOIL COLUMN SURROUNDING THE IMPACTING BODY
Maxwell B. Blanchard and Harry D. Shade (LFE Corp., Richmond Calif.) Apr. 1975 17 p refs

(NASA-TM-X-62428; A-6036) Avail: NTIS HC $3.25 CSCL 03B

A prototype penetrator instrument was impacted into a dry lake bed. Laboratory studies of the soil surrounding the penetrator revealed that the soil was contaminated by paint and metal from the penetrator's casing. Paint pigment rich in titanium and sulfur was found in the adjacent soil. The highly mobile paint pigment migrated onto viewing ports in the penetrator's exterior. Bulk analysis of the soil adjacent to the impactor showed a significant increase in both elements, as well as the presence of metal chips from the casing and nose cone. It is recommended that great care be taken in the use of coating materials and the metal alloys selected for the penetrator's exterior, or the accuracy of any experiment requiring an uncontaminated in situ sample may be adversely affected. Author

N75-23446*# Kanner (Leo) Associates, Redwood City, Calif.
ANALYSIS OF TERRAIN CONDITIONS IN THE LANDING SITE OF THE MARS-6 AUTOMATIC INTERPLANETARY STATION
R. B. Zezin, V. P. Karyagin, I. P. Mamoshina, N. A. Morozov, V. M. Pavlova, M. K. Rozdestventskiy, and V. G. Fokin Washington NASA May 1975 15 p refs Transl. into ENGLISH from Kosm. Issled. (USSR), v. 13, no. 1, Jan.-Feb. 1975 p 99-107
(Contract NASw-2481)
(NASA-TT-F-16349) Avail: NTIS HC $3.25 CSCL 22A

On 12 March 1974 the descent module (DM) of the Mars-6 automatic interplanetary station reached the surface of Mars in the designated landing site. The descent of DM -- from atmospheric entry and aerodynamic braking to parachute--assisted descent inclusively -- followed the program. During the parachute descent, lasting approximately 150 sec, direct measurements of the parameters of the Martian atmosphere were made the first time. Based on all available information on the landing site, a detailed analysis was made of the terrain of the DM landing site. Author

N75-23447# Office National d'Etudes et de Recherches Aerospatiales, Toulouse (France). Dept. d'Etudes et de Recherches en Technologie Spatiale.
MICROCRATERS OBSERVED ON LUNAR ROCK 15015 AND METEOROID FLUX [MICROCRATERES OBSERVES SUR LA BRECHE LUNAIRE 15015 ET FLUX DE MICROMETEOROIDES]
J. C. Mandeville Nov. 1974 13 p refs In FRENCH
(ONERA-DERTS-NT-01-17) Avail: NTIS HC $3.25

The study of a sample from lunar rock 15015 returned with Apollo 15 flight is presented with regard to the dimensions, flux, and cumulated distribution of micrometeoroids. Craters are shown to have 20 and 450 micron diameters and a morphology characteristic of particle velocities up to 20 km/s by scanning microscope observation. The crater diameter is calibrated with respect to incident particle mass by aluminum projectile simulation. The mean density of micrometeoroids is of order 3 gram/cubic cm, the exposition time to the meteoroid flux gives the mean value of the cumulated flux which is consistent with the values found by Neukum. ESRO

N75-23448# Iowa Univ., Iowa City. Dept. of Physics and Astronomy.
PIONEER 11 OBSERVATIONS OF ENERGETIC PARTICLES IN THE JOVIAN MAGNETOSPHERE
J. A. VanAllen, B. A. Randall, D. N. Baker, C. K. Goertz, and D. D. Sentman Feb. 1975 25 p refs
(Contract N00014-68-A-0-196-0009)
(AD-A006927; U-of-Iowa-75-9) Avail: NTIS CSCL 03/2

Positional distributions, absolute intensities, energy spectra, and angular distributions of energetic electrons and protons in the Jovian magnetosphere are discussed. GRA

N75-23409 Max-Planck-Institut fuer Kernphysik, Heidelberg (West Germany).
MICROCRATERS ON LUNAR SAMPLES
H. Fechtig, W. Gentner, J. B. Hartung, K. Nagel, G. Neukum, E. Schneider, and D. Storzer *In* Arbeitsgemeinschaft fuer Weltraumforsch. Helios Satellite Sci. Data Evaluation Oct. 1974 p 195-200 refs (For availability see N75-23393 14-88)

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N75-23449 Institut d'Aeronomie Spatiale de Belgique, Brussels.
NEW MEASUREMENTS OF THE SOLAR ULTRAVIOLET IN THE STRATOSPHERE [NOUVELLES MESURES DE L'ULTRAVIOLET SOLAIRE DANS LA STRATOSPHERE]
P. Simon 1975 23 p refs In FRENCH; ENGLISH summary Presented at the Anglo-French Symp. on Meteorological Effects of Stratospheric Aircraft (COMESA/COVOS), Oxford, 24-26 Sep. 1974 Submitted for publication
(Aeronomica-Acta-A-145-1975) Avail: Issuing Activity

To investigate the photodissociation of planetary atmosphere constituents under the ultraviolet solar radiation effect, new measurements were taken of the solar flux in the wavelength bands 196 to 230 nm and 284 to 340 nm in the stratosphere with an Ebert-Fastie spectrometer of focal length 25 cm with a pass-band of 0.6 nm. The instrument was on a stabilized stratospheric gondola and was directed towards the sun. The ultraviolet solar spectra obtained with various solar zenith angles lead, by extrapolation to zero air-mass, to the determination of the magnitude of the extraterrestrial solar flux. Below 225 nm the newly measured values are lower than those generally adopted, the apparent temperature of the sun being of the order of 4700 K at 200 nm. Between 225 nm and 310 nm and for wavelengths greater than 310 nm they agree with previous results. Moreover, the experimentally determined optical thicknesses are in reasonably good agreement with the theoretically calculated values for oxygen and ozone atmosphere. Author (ESRO)

N75-23450*# Maryland Univ., College Park. Dept. of Physics and Astronomy.
UNUSUAL EMISSION OF IRON NUCLEI FROM THE SUN
G. Gloeckler, D. Hovestadt (Max Planck Inst., Garching, West Germany), O. Vollmer (Max Planck Inst., Garching, West Germany), and C. Y. Fan (Arizona Univ., Tucson) 25 Apr. 1975 14 p refs
(Contract NAS5-11063)
(NASA-CR-142712; TR-75077) Avail: NTIS HC $3.25 CSCL 03B

Sustained emission of low energy solar particles with a composition richer in iron than oxygen is observed in the time period 1974 May 7 to 17. Between 0.7 and 4 MeV/nucleon the relative abundances of C:O:Fe are 0.24:1:1.35. It was suggested that these observations provide indication for effects of heavy ion enrichment in the lower corona of the sun. Author

N75-23451*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SOLPRO: A COMPUTER CODE TO CALCULATE PROBABILISTIC ENERGETIC SOLAR PROTON FLUENCES
E. G. Stassinopoulos Apr. 1975 27 p refs
(NASA-TM-X-72573; NSSDC-75-11) Avail: NTIS HC $3.75 CSCL 03B

A code was developed for the calculation of interplanetary solar proton fluences at 1 AU for the active years 1977 to 1983. The fluences are presented as functions of mission duration tau, energy threshold E, and confidence level Q. For a given combination of tau and Q, the routine determines whether ordinary or anomalously large events are to be considered, and in the latter case, the number of anomalously large events that are predicted by probabilistic theory for the specified mission duration. The code is described in detail. A listing and sample calculations are included. Author

N75-23452# Osservatorio Astronomico, Rome (Italy).
SOLAR PHENOMENA Monthly Bulletin, Sep. 1974
Massimo Cimino Sep. 1974 12 p
(Publ-197) Avail: NTIS HC $3.25

Solar data for September 1974 are presented. Tables include: daily total areas of sunspot groups; heliographic position, classification and area of sunspot groups; longtitudinal sunspot magnetic fields, and hours of k-line cinematographic patrol. ESRO

N75-23453# Osservatorio Astronomico, Rome (Italy).
SOLAR PHENOMENA Monthly Bulletin, Oct. 1974
Massimo Cimino Oct. 1974 10 p
(Publ-198) Avail: NTIS HC $3.25

Solar data for October 1974 are presented. Tables include: daily total areas of sunspot groups; heliographic position, classification and area of sunspot groups; longitudinal sunspot magnetic fields, and hours of K-line cinematographic patrol, SCNA and SEA. ESRO

N75-23454# Academy of Sciences (USSR), Moscow. Inst. for Space Research.
STUDY OF SOLAR PLASMA NEAR MARS AND ALONG THE EARTH TO MARS PATH BY MEANS OF CHARGED PARTICLE TRAPS ABOARD THE SOVIET SPACECRAFTS LAUNCHED IN 1971-1973. PART 3: CHARACTERISTICS OF ION AND ELECTRON PLASMA COMPONENTS IN ANTISOLAR PART OF THE NEAR-MARTIAN SPACE AS MEASURED ABOARD THE SATELLITE "MARS-5"
K. I. Gringauz, B. B. Bezrukikh, M. I. Verigin, and A. P. Remizov 1974 18 p refs
(PR-192) Avail: NTIS HC $3.25

Results of measurements made on board Mars 5 by means of wide angle charged particle traps, concerning boundary position and characteristics of the transition layers behind the Martian bow shock are presented. Measured characteristics of the plasma formation located behind the inner boundary of the transition layer at the antisolar part of near-Martian space are considered. The nature of its interpretation as the plasma sheet in the Martian magnetospheric tail are discussed. ESRO

N75-23455# National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo.
SOLAR-GEOPHYSICAL DATA NUMBER 363, NOVEMBER 1974, PART 1: (PROMPT REPORTS). DATA FOR OCTOBER, SEPTEMBER 1974
Hope I. Leighton Nov. 1974 127 p
(COM-74-50190-363-1; SGD-363-Pt-1; NOAA-74122608) Avail: NTIS MF $2.25; HC available from National Climatic Center, Attn: Publications., Federal Bldg., Asheville, N. C. 28801. Subscription $34.50/year includes Part 1 (Prompt reports) and Part 2 (Comprehensive reports); $18.00/year for either part including extra issue. $1.40/copy for either part; $1.30 for extra issue CSCL 03B

Prompt reports are given on data for October 1974 and September 1974. These deal with alert periods, daily solar indices, solar flares, solar radio waves, spacecraft observations, solar proton monitoring, inferred IP magnetic field polarities, daily solar activity centers, sudden ionospheric disturbances, cosmic rays, geomagnetic indices, and radio propagation indices. This issue also includes an index for 1973 and 1974. GRA

N75-23456# National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo.
SOLAR-GEOPHYSICAL DATA NUMBER 363, NOVEMBER 1974, PART 2: (COMPREHENSIVE REPORTS). DATA FOR MAY - APRIL 1974 AND MISCELLANEA
Hope I. Leighton Nov. 1974 51 p
(COM-74-50190-363-2; SGD-363-Pt-2) Avail: NTIS MF $2.25; HC available from National Climatic Center, Attn: Publications., Federal Bldg., Asheville, N. C. 28801. Subscription $34.50/year includes Part 1 (Prompt reports) and Part 2 (Comprehensive reports); $18.00/year for either part including extra issue. $1.40/copy for either part; $1.30 for extra issue CSCL 03B

This issue provides comprehensive data for May 1974 to April 1974 on solar flares, solar radio waves, magnetograms of geomagnetic storm, abbreviated calendar record, regional flare index, and DAPP Auroral photograph. It also includes miscellaneous data on neutron monitor--Thule--August 1974. GRA

N75-23457# Oslo Univ. (Norway). Inst. of Theoretical Astrophysics.
STRAY LIGHT IN SOLAR OBSERVATIONS, A METHOD OF NUMERICAL INTEGRATION
R. Brahde 19 Sep. 1974 55 p refs
(Grant AF-AFOSR-2294-72; AF Proj. 7649)
(AD-A002608; AFCRL-TR-74-0562) Avail: NTIS CSCL 03/2

A new formula for the scattering of light has been tried out on 52 scans of the solar and lunar limbs during the partial eclipse of February 25, 1971. The complete stray light function can be handled with the method of numerical integration. The corrections for stray light in a sunspot are shown for two cases. The FORTRAN programs are presented with comments.
Author (GRA)

N75-23394 Bonn Univ. (West Germany). Inst. fuer Astronomie.
A COMMENT ON THE FARADAY-ROTATION EXPERIMENT
H. Volland *In* Arbeitsgemeinschaft fuer Weltraumforsch. Helios Satellite Sci. Data Evaluation Oct. 1974 p 9-11 refs (For availability see N75-23393 14-88)

N75-23395 Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Flugfunk und Mikrowellen.
DETERMINATION OF THE CORONAL ELECTRON DENSITY DISTRIBUTION FROM RANGE AND RANGE RATE DATA DURING SOLAR OCCULTATIONS OF THE HELIOS SPACECRAFT
P. Edenhofer *In* Arbeitsgemeinschaft fuer Weltraumforsch. Helios Satellite Sci. Data Evaluation Oct. 1974 p 12-14 (For availability see N75-23393 14-88)

N75-23398 Tubingen Univ. (West Germany). Lehrstuhl fuer Theoretische Astrophysik.
CONNECTIONS BETWEEN THE HELIOS X RAY MEASUREMENTS AND OTHER OBSERVATIONS
G. Elwert *In* Arbeitsgemeinschaft fuer Weltraumforsch. Helios Satellite Sci. Data Evaluation Oct. 1974 p 23-29 refs (For availability see N75-23393 14-88)

N75-23399 Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestrische Physik.
RADIAL GRADIENTS IN SOLAR WIND PLASMA
Rainer Schwenn *In* Arbeitsgemeinschaft fuer Weltraumforsch. Helios Satellite Sci. Data Evaluation Oct. 1974 p 30-40 (For availability see N75-23393 14-88)

N75-23400 Max-Planck-Institut fuer Extraterrestrische Physik, Garching (West Germany).
CHEMICAL COMPOSITION OF THE SOLAR WIND (MEASUREMENT POSSIBILITIES OF THE PLASMA EXPERIMENT OF THE HELIOS PROBE) [DIE CHEMISCHE ZUSAMMENSETZUNG DES SOLAREN WINDES (MESSMOEGLICHKEITEN DES PLASMA-EXPERIMENTS AUF DER SONDE HELIOS)]
H. Miggenrieder *In* Arbeitsgemeinschaft fuer Weltraumforsch. Helios Satellite Sci. Data Evaluation Oct. 1974 p 41-51 refs In GERMAN (For availability see N75-23393 14-88)

N75-23401 Technische Universitaet, Brunswick (West Germany). Lehrstuhl B fuer Theoretische Physik.
SOLAR WIND INTERACTION WITH THE HELIOS SPACE PROBE AND RELATED PERTURBATIONS OF LOW ENERGY PARTICLE SPECTRA
B. Koenemann, G.-H. Voigt, H. Schroeder, and U. Isensee *In* Arbeitsgemeinschaft fuer Weltraumforsch. Helios Satellite Sci. Data Evaluation Oct. 1974 p 52-97 refs (For availability see N75-23393 14-88)

N75-23402 Kiel Univ. (West Germany). Inst. fuer Reine und Angewandte Kernphysik.
PROPAGATION OF ALFVEN WAVES IN THE INHOMOGENEOUS INTERPLANETARY MEDIUM
Arne K. Richter *In* Arbeitsgemeinschaft fuer Weltraumforsch. Helios Satellite Sci. Data Evaluation Oct. 1974 p 98-112 refs Sponsored by Deut. Forschungsgemeinschaft (For availability see N75-23393 14-88)

N75-23403 Kiel Univ. (West Germany). Inst. fuer Reine und Angewandte Kernphysik.
HELIOS EXPERIMENT NO. 6: DESCRIPTION IN TABLES
H. Kunow, G. Green, M. Witte, R. Mueller-Mellin, and H. Hempe *In* Arbeitsgemeinschaft fuer Weltraumforsch. Helios Satellite Sci.

Data Evaluation Oct. 1974 p 113-119 In GERMAN and ENGLISH (For availability see N75-23393 14-88)

N75-23404 Kiel Univ. (West Germany). Inst. fuer Reine und Angewandte Kernphysik.
SEPARATION OF SOLAR AND INTERPLANETARY TRANSPORT PROCESSES FOR FLARE ACCELERATED PARTICLES
R. Reinhard and G. Wibberenz *In* Arbeitsgemeinschaft fuer Weltraumforsch. Helios Satellite Sci. Data Evaluation Oct. 1974 p 120-142 refs (For availability see N75-23393 14-88)

N75-23405 Kiel Univ. (West Germany). Inst. fuer Reine und Angewandte Kernphysik.
THE INFLUENCE OF FINITE INJECTION PERIODS ON ANISOTROPIES DURING SOLAR PARTICLE EVENTS
B.-M. Schulze, A. K. Richter, and G. Wibberenz *In* Arbeitsgemeinschaft fuer Weltraumforsch. Helios Satellite Sci. Data Evaluation Oct. 1974 p 143-158 refs Sponsored in part by Deut. Forschungsgemeinschaft (For availability see N75-23393 14-88)

93 SPACE RADIATION

Includes cosmic radiation and inner and outer earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N75-23458 New York State Univ., Albany.
THE NATURE OF LOW ENERGY INTERPLANETARY HEAVY NUCLEI DOWN TO ENERGIES OF 50 KEV/AMU FROM AN ANALYSIS OF SOLID STATE ETCHED-TRACK DETECTORS FROM THE SURVEYOR 3 SPACECRAFT AND THE APOLLO 16 AND 17 COSMIC EXPERIMENTS Ph.D. Thesis
Richard Thomas Woods 1974 256 p
Avail: Univ. Microfilms Order No. 75-9626

Detectors were exposed directly to space, and heavy ions of energies down to 0.05 Mev/amu were observed. The origin (solar or galactic), composition, and directionality of these heavy ions were sought. From the charge-threshold capabilities of the detectors and calibration irradiations on the detectors, it was concluded that predominantly ions of the Fe group were recorded during these experiments. The relative levels of solar activity during the exposure times of these three experiments ranged from very active to nearly quiet, yet in each experiment solar-related anisotropies were observed. Differential energy spectra from all three experiments were approximately of the form 1/e cubed, characteristic of solar flare particles, where E is kinetic energy in Mev/amu. It was concluded that heavy ions recorded by detectors from all three experiments were solar.
Dissert. Abstr.

N75-23459 California Univ., Los Angeles.
WHERE ARE THEY NOW? COSMIC RAYS FROM SUPERNOVAE Ph.D. Thesis
James Conway Higdon 1974 144 p
Avail: Univ. Microfilms Order No. 75-9395

The possibility of observing the early stages of cosmic ray propagation near young supernova remnants was examined. As the cosmic rays propagate away from the supernovae, they produce an expanding diffuse relativistic particle cloud which interacts with the surrounding interstellar magnetic field, gas, and photons. It was found that the most likely process by which such cosmic ray cloud could be detected is gamma ray emission through pion production. Diffusive models were used for propagation, and the gamma ray radiation was calculated from various possible diffuse cosmic ray clouds in the vicinity of known supernova remnants. The results of SAS-2 observations are also presented. It was found that the total cosmic ray energy release, an order of magnitude greater than the required mean energy release per supernova, means that either only a fraction of supernovae produce cosmic rays or only a small fraction of the mean path length of the cosmic rays is traversed in the interstellar medium.
Dissert. Abstr.

N75-23460 California Univ., San Diego.
OBSERVATION OF PULSED AND NONPULSED GAMMA RADIATION FROM THE CRAB NEBULA NEAR 1 MeV Ph.D. Thesis
Duane Edward Gruber 1974 99 p
Avail: Univ. Microfilms Order No. 75-8259

Gamma-rays in the energy range 0.2 to 10 MeV were observed from the Crab Nebula and its central pulsar, NP 0532, on three occasions in 1971. A gamma-ray telescope, a 12 cm diameter by 7.6 cm thick scintillation crystal detector with an active, cup-shaped, CsI(Na) collimator of average thickness 7 cm, and a supporting balloon gondola and telemetry were designed and built. A careful and systematic analysis of the data was made to determine the detector background level to a precision of + or - 0.4% during the four-hour long transit of source through the instrument aperture. Possible drifts of detector calibration and efficiency were monitored to the necessary accuracy. A large change of detector background, which results largely from leakage through the shield of atmospheric gamma-ray and neutron secondaries of cosmic rays, was measured, found to be consistent with a simple model, based on north-south drift in the earth's magnetic field, and was separated in the data from the Crab nebula response to the necessary precision.
Dissert. Abstr.

N75-23461 California Univ., Los Angeles.
RADIATION BELT ELECTRON PRECIPITATION AND ITS IONOSPHERIC EFFECTS AT MIDDLE LATITUDES Ph.D. Thesis
Walther Nordmann Spjeldvik 1974 165 p
Avail: Univ. Microfilms Order No. 75-9436

The role of radiation belt electron precipitation into the Earth's atmosphere at middle geomagnetic latitudes is studied. The process of pitch angle scattering of energetic electrons in the radiation belts is modeled, and the flux angular distributions are obtained for all pitch angles, including the atmospheric bounce loss cone. The interaction of these fluxes with the ambient atmospheric constituents is simulated, and the rate of energy deposition in the atmosphere is calculated at any given height. The influence of this precipitation induced ionization on the structure and composition of the ionospheric D-region is modeled.
Dissert. Abstr.

N75-23462 Houston Univ., Tex.
THE MULTIPLE SCATTERING OF COSMIC RAY MUONS ABOVE 2.5 GeV/c Ph.D. Thesis
Alfred Richard Osborne 1974 291 p
Avail: Univ. Microfilms Order No. 75-8248

The multiple scattering of cosmic ray muons in a magnetic momentum spectrometer was investigated both theoretically and experimentally. Theoretically, the multiple scattering theory of Moliere was modified to account for observations made with magnetic spectrometers. Experimentally, 8000 muon events were analyzed in the momentum region 2.5 GeV/c to 200 GeV/c for a target thickness of one meter of iron. Good agreement is found between the theoretical and experimental results.
Dissert. Abstr.

N75-23463 Houston Univ., Tex.
COSMIC RAY MUON SPECTRUM AND CHARGE RATIO Ph.D. Thesis
Mohamed Saad El-Din Abdel-Monem 1974 242 p
Avail: Univ. Microfilms Order No. 75-10993

The absolute cosmic ray muon spectrum and charge ratio for zenith angles 0 deg, 65 deg and 80 deg was investigated. Theoretically, models of high energy interactions are used to calculate the spectrum of cosmic ray muons at sea level. The charge ratio is calculated as well. Experimentally, the muon differential and integral intensities as well as the charge ratio have been measured using a magnetic spectrometer. A comparison is made between the measured spectrum and that predicted on the basis of the four theoretical models. The data were fitted to a previous phenomenological model. It is concluded that the measured muon differential intensities, predicted charge ratio, and spectrum show good agreement with the models used and with previous data.
Dissert. Abstr.

N75-23464*# Maryland Univ., College Park. Dept. of Physics and Astronomy.
A DYNAMIC MODEL FOR THE TIME EVOLUTION OF THE MODULATED COSMIC RAY SPECTRUM
J. J. OGallagher and G. A. Maslyar, III May 1975 34 p refs (Grant NGR-21-002-316)
(NASA-CR-142713; TR-75-079) Avail: NTIS HC $3.75 CSCL 04A

A recently developed model predicts an energy dependent phase lag in the modulated cosmic ray density U(t) given by U(t) approximately equal to US (t - tau) where US is the solution to the Fokker-Planck equation under time independent conditions and tau is the average time spent by particles inside the modulating region. The delay times tau are functions of modulating parameters R (the radius of the modulating cavity), V (the solar wind velocity), and K (the effective average diffusion-coefficient which is a function of energy). This model is applied to predict the time evolution of the modulated cosmic ray proton spectrum over a simulated solar cycle. A modulation produced mostly by varying R over the solar cycle is less consistent with the observations. Author

99 GENERAL

N75-23465# Joint Publications Research Service, Arlington, Va.
TRANSLATIONS ON EAST EUROPE: SCIENTIFIC AFFAIRS, NO. 463
5 May 1975 49 p Transl. into ENGLISH from various East European reports
(JPRS-64694) Avail: NTIS HC $3.75

Summaries are given on Bulgarian research in nuclear physics, electronic technology and equipment development, and spacecraft communication and television broadcasts. For individual titles, see N75-23466 through N75-23468.

N75-23466 Joint Publications Research Service, Arlington, Va.
PROGRESS IN NUCLEAR RESEARCH OUTLINED c73
Ya. Kristov *In its* Transl. on Eastern Europe: Sci. Affairs, No. 463 (JPRS-64694) 5 May 1975 p 1-9 Transl. into ENGLISH from Priroda (Sofia), no. 1, 1975 p 7-12 (For availability see N75-23465 14-99)

Bulgarian research and development activities in nuclear physics are reported. Data cover the development of the IRT-2000 experimental reactor, reactor physics, nuclear engineering, nuclear research methods, and reactor instrumentation development. E.H.W.

N75-23467 Joint Publications Research Service, Arlington, Va.
ACTIVITIES OF ELECTRONICS INSTITUTE DESCRIBED c33
Emil Dzhakov *In its* Transl. on Eastern Europe: Sci. Affairs, No. 463 (JPRS-64694) 5 May 1975 p 10-16 Transl. into ENGLISH from Priroda (Sofia), no. 1, 1975 p 12-15 (For availability see N75-23465 14-99)

Experimental research in physical electronics, electron optics, high and superhigh vacuums, electronic equipment development, nonlinear and parametric phenomena, and laser design and technology is outlined. Summaries are also given of work in dielectrics, semiconductor technology, digital systems and methods, and plasma interactions with metal vapors. E.H.W.

N75-23468 Joint Publications Research Service, Arlington, Va.
FIRST TELECAST BY SATELLITE IS SUCCESSFUL c17
Kiril S. Serafimov *In its* Transl. on Eastern Europe: Sci. Affairs, No. 463 (JPRS-64694) 5 May 1975 p 17-19 Transl. into ENGLISH from Spisanie Bulgar. Akad. Nauk. (Sofia), no. 4, 1974 p 70-72 (For availability see N75-23465 14-99)

Direct communication from Sofia to Moscow, via a Mars mobile satellite communication station and the Molniya-2 satellite, is reported. The station is a mobile light weight version of the ground station of the INTERSPUTNIK system; however, station characteristics are substantially different from those of the stationary version. Broadcasts were effected by a device which automatically tracks the Molniya-2 satellite in its elliptical orbit. Radio equipment electromagnetic compatibility problems and their solutions are discussed. E.H.W.

N75-23469# Strategic Air Command, Offutt AFB, Nebr.
GIANT SWITCH B-52/AUTOMATED OFFSET UNIT (AOU) INITIAL OPERATIONAL TEST AND EVALUATION Final Report, 28 Feb. 1973 - 15 Jan. 1975
Francis N. Busch 6 Feb. 1975 40 p refs
(AD-A006895) Avail: NTIS CSCL 19/5

HQ USAF PMD R-Q 2441 implemented a modification to the B-52G/H BNS. The PMD specifically charged SAC with conducting a flight test demonstration of the prototype Automated Offset Unit (AOU). IBM was awarded a contract for the design, engineering, and test effort for AOU. HQ SAC conducted an IOT and E during Nov-Dec 74. The criticality of available flying time dictated that the SAC IOT and E and AFLC's Flight Verification Testing be conducted in close harmony and on the same flight missions. Four sorties were flown from Robins AFB, Georgia, and 80 simulated weapon releases were accomplished. It was concluded from the flight test results that the AOU was operationally effective and suitable for incorporation into the AN/ASQ-38 System. GRA

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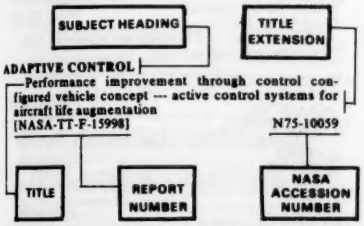

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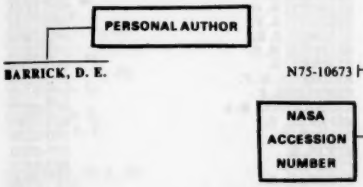

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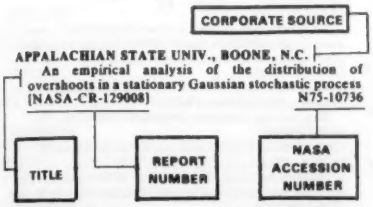

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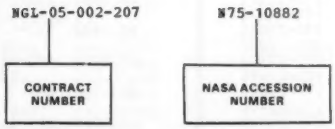

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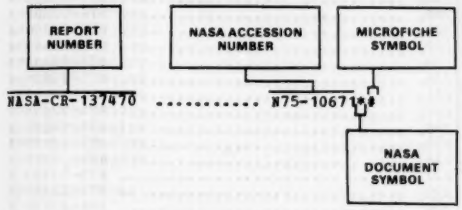

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